# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1926.] LONDON, APRIL 10, 1900. [52ND YEAR. PRICE 6d.



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Yield of Gas per Ton . . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

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Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
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FOR
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For use in the
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ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
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**Parker's Imperial Black Varnish,**
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And Fittings and Accessories.

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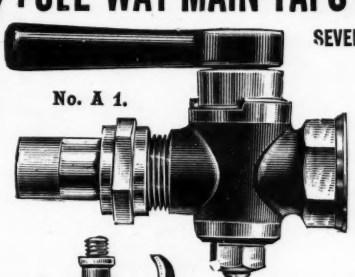
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH.

The "DEMAND," REGISTERED *

**BIGGS, WALL, & CO.,**
GAS AND WATER ENGINEERS,
**13, CROSS STREET, FINSBURY PAVEMENT,**
**LONDON, E.C.**

WRITE FOR OUR **PRICE LISTS** OF
**FULL-WAY MAIN TAPS & LANTERN TAPS.**
SEVERAL DESIGNS SHOWN BELOW.



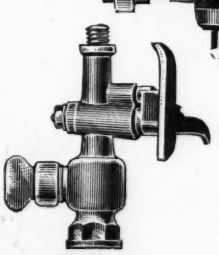
No. A 1.

THESE TAPS ARE
**FULL-WAY**
AS SHOWN.

No. A.

SUPERIOR QUALITY AND FINISH IN GUN METAL.

**LANTERN TAPS.**



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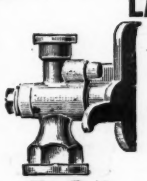

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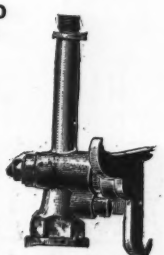
No. A 12.

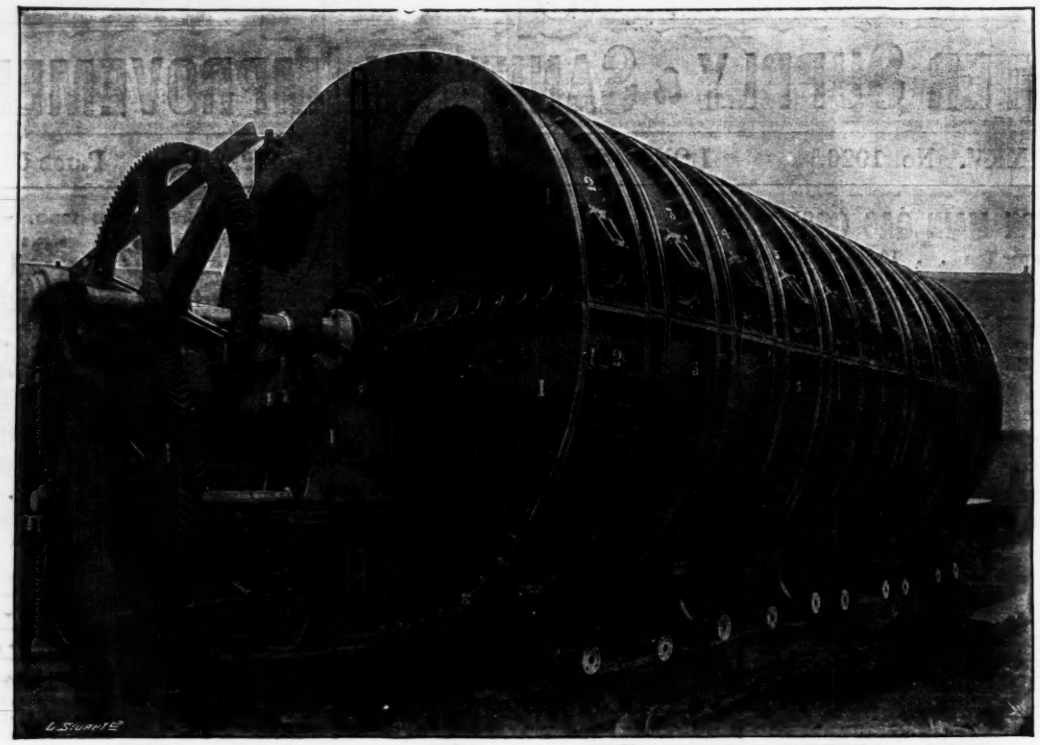


No. A 1.

* Specially constructed for New Incandescent Burner.

# PATENT "NEW" SCRUBBER-WASHER

RESULTS GUARANTEED.



RESULTS GUARANTEED.

**Photo. of Machine recently erected at Gaythorn Gas-Works, Manchester.**

**NOTE:** Orders already received in **1900** for MACHINES to deal with **30,300,000** cubic feet of Gas per Diem.

*Extract from Paper by* Mr. T. N. RITSON, Assoc.M.Inst.C.E., of Kendal, *read before the* MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS, *June* 3, 1899.

"A HOLMES' PATENT ROTARY 'NEW' WASHER-SCRUBBER was erected in the autumn of 1895, and is capable of dealing with half-a-million cubic feet of gas per day. This washer completely purifies the gas from ammonia, with from 10 to 12 gallons of water per ton of coal carbonized, leaving only 0·3 to 0·5 grain of ammonia per 100 cubic feet of gas at the outlet. Since this machine was erected, THE YIELD OF SULPHATE OF AMMONIA HAS BEEN MORE THAN DOUBLED."—"JOURNAL OF GAS LIGHTING," *June* 6, 1899.

*Extract from the* PRESIDENTIAL ADDRESS by Mr. T. N. RITSON, Assoc.M.Inst.C.E. (Kendal), at the ANNUAL MEETING of the MANCHESTER DISTRICT INSTITUTION of GAS ENGINEERS, held in Manchester, *Feb.* 24, 1900.

"The growing demand for Ammonia in connection with Agricultural and Industrial purposes has called for high-class Washing and Scrubbing Plant. The question of MECHANICAL WASHERS *versus* TOWER SCRUBBERS is one upon which a good deal of diversity of opinion exists. At my own works I have adopted a MECHANICAL WASHER in combination with a Tower Scrubber. I had long ago formed the opinion that the employment of too much washing water was to be deprecated. More damage is done by over-washing than is generally supposed. The primary object to be kept in view is to select a machine, which, whilst of convenient size and form, will remove the whole, or practically the whole, of the $NH_3$ with the minimum of water. It is well known that water dissolves out a small quantity of the Illuminating Hydrocarbons from the gas, and the loss of these, if the washing water is unduly great, may appreciably affect the illuminating power of the gas. Moreover, the quantity of water employed in order to remove the Ammonia ought not to be more then will give a strength of liquor not lower than the practical commercial minimum. The Washer in operation at Kendal has a gross volume of 254·4 cubic feet, and is capable of dealing with half-a-million cubic feet of crude gas per diem. So far it has efficiently dealt with 336,000 cubic feet, equal to 1322·3 cubic feet per cubic foot of gross volume, with an average production—by the distillation test—of 29 oz. liquor, and with the employment of from 8 to 9 gallons of water per ton of coal carbonized. *The small quantity—0·48 to 0·50 grains of $NH_3$ per 100 cubic feet of gas found in the outlet gas, and taking into account the fact that analysis of the liquor shows it to be fully saturated with carbonic and hydrosulphuric acids, satisfies me of the efficiency of the machine.*"—"JOURNAL OF GAS LIGHTING," *Feb.* 27, 1900.

Patentees and Sole Makers:

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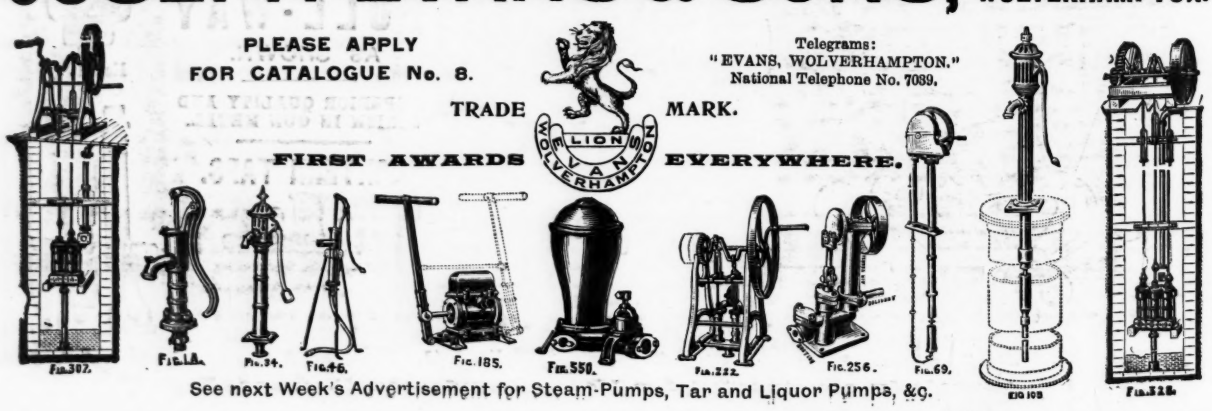


See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

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Late LAIDLAW, SONS, & CAINE, Limited,

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ROOFING OF EVERY STYLE.

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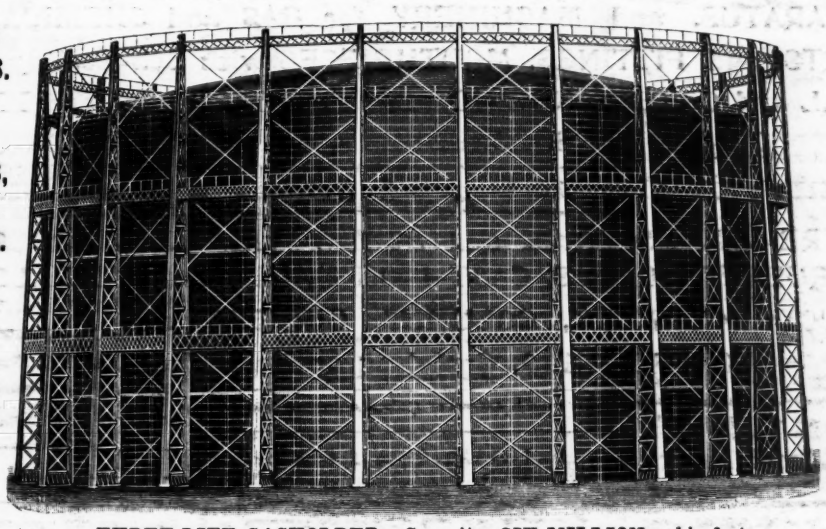

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GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet.
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ATLAS METER WORKS, OLDHAM.

Manufacturers of

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We are now supplying our Wet Coin Meters in Cast-Iron and Tin-Plate Cases, both Ordinary and Compensating; also Dry Coin Meters in Tin-Plate Cases.

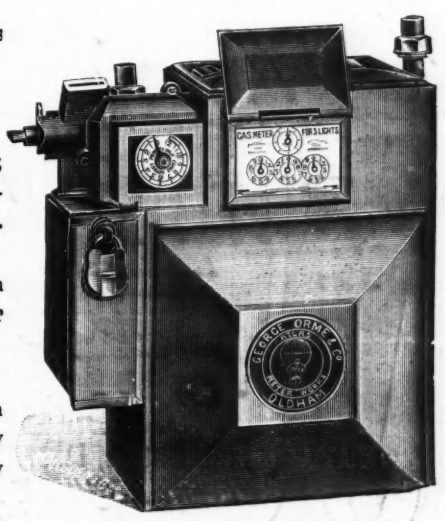
WET COIN METER IN CAST-IRON CASE.

A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

We supply them to work with **1d., 1s., or any other Coin desired.**

The Selling Price of Gas can be changed *in Situ*, and any number of feet delivered, as may be required.



DRY COIN METER IN TIN-PLATE CASE.

*Any further Particulars sent upon application.*

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Manufacturers of every description of

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RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

CONDENSERS, SCRUBBERS, and WASHERS.

**PURIFIERS with Planed Joints a Speciality.**

Patent CENTRE-VALVES, RACK and SCREW VALVES, WOOD GRIDS, and SCRUBBER-BOARDS, CAST-IRON MAINS, and SPECIALS.

STRUCTURAL WORK, COLUMNS, GIRDERS, and ROOFING.

GASHOLDERS, Cast-Iron or Steel Tanks.

*DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.*

PIG IRON (Special Quality) for Engine Cylinders. GAS COAL famous for its UNRIVALLED EXCELLENCE.

FOR **COKE**

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Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

## NEWBATTLE CANNEL.

**Highest Results in Gas, & Excellent Coke.**

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LIMITED,

NEWBATTLE COLLIERIES,

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## SULPHURIC ACID.

GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

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## MIRFIELD

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***Prices and Analysis on application.***

**MIRFIELD (GAS-COAL) COLLIERY COMPY.**

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| Yield of Gas per Ton . . | 10,500 Cub. Ft. |
| Illuminating Power . . . | 16·9 Candles. |
| Coke (of good quality) . . | 67·5 per Cent. |
| Sulphur . . . . . | 0·58 ,, |
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**For Price, &c., apply to the**

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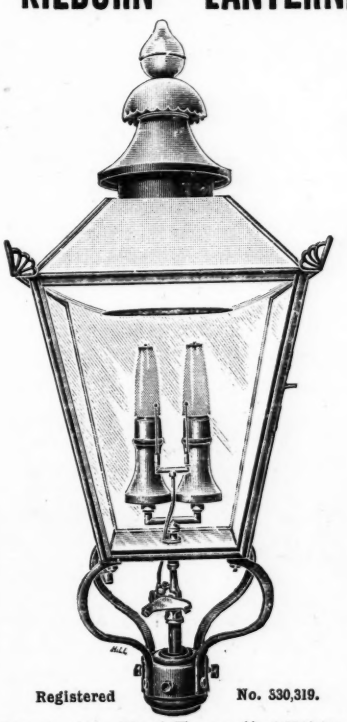
THE

## "KILBURN" LANTERN.



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**GREAT SAVING IN TIME, PAINT, AND LABOUR.**

Painting Speed—3 Square Yards a Minute. Lime-Wash Speed—12 Square Yards a Minute.

Paint Machine, attached to a Single Air-Compressor, Driven by Belt Power. Can also be driven from existing Air-Mains.

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|---|---|---|---|---|---|
| No. 1 | Painter | £25 | Single Air Compressor | £17 | 10 |
| No. 2 | ,, | £30 | | | |
| No. 3 | ,, | £35 | Double ditto | £27 | 0 |

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**Larger size Engine, &c., adapted for working up to 4 Machines . . . £180.**

**Painting Machines Extra.**

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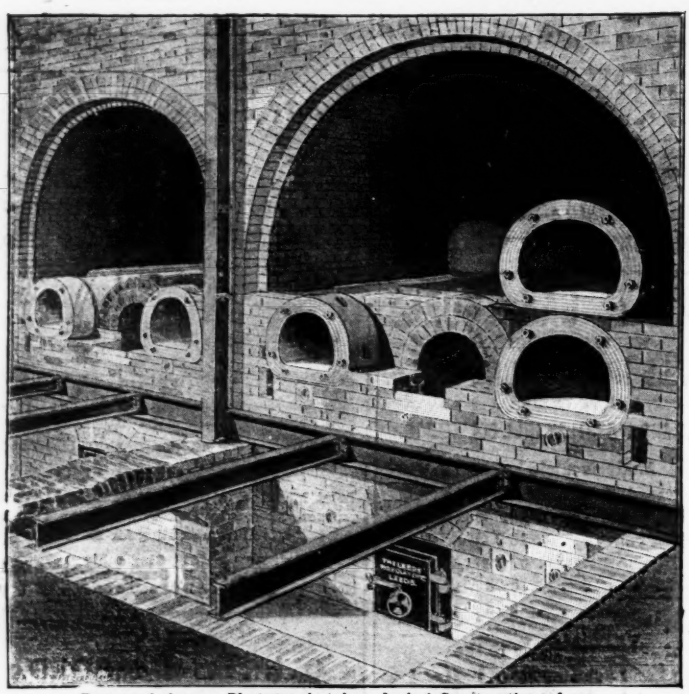

Engraved from a Photograph taken during Construction of our Shallow Regenerator Settings.

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OF EVERY DESCRIPTION
INCLINED, HORIZONTAL,
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A SPECIALITY

MANY INSTALLATIONS.
EXCELLENT RESULTS OBTAINED.

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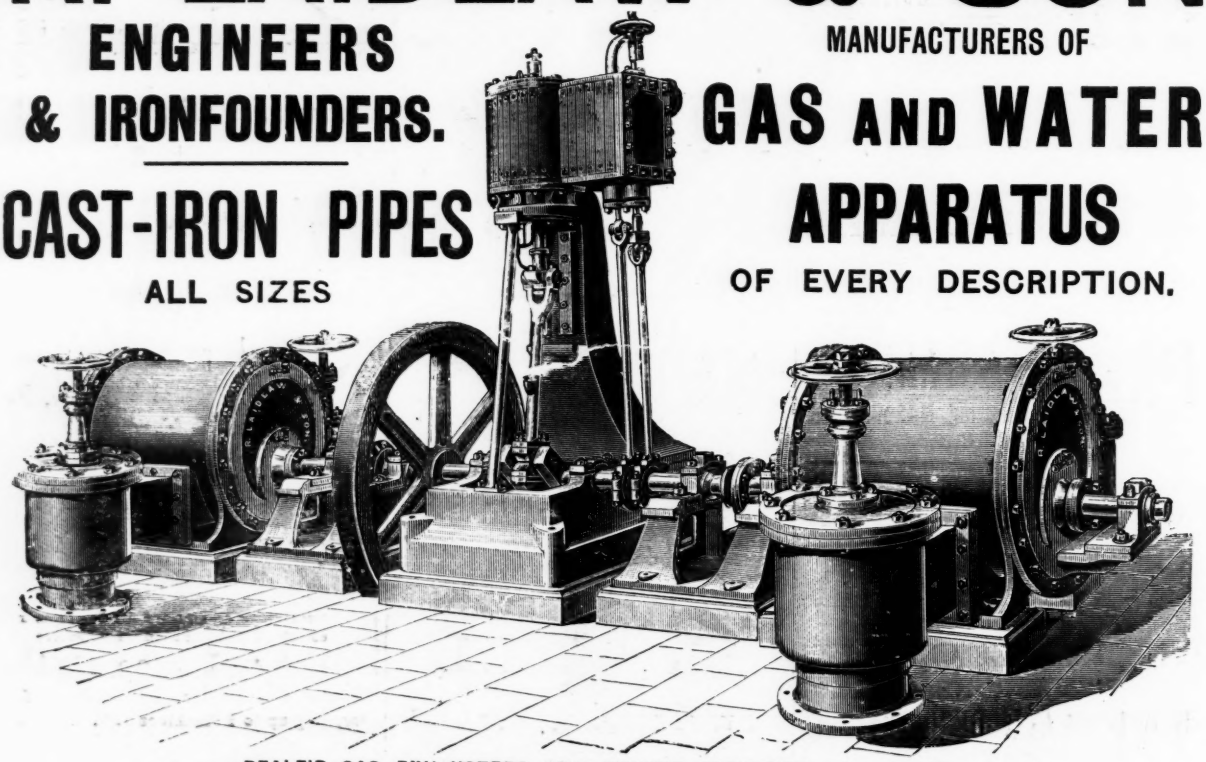
ALL SIZES

## GAS AND WATER APPARATUS

OF EVERY DESCRIPTION.



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**ASTON, BIRMINGHAM.**

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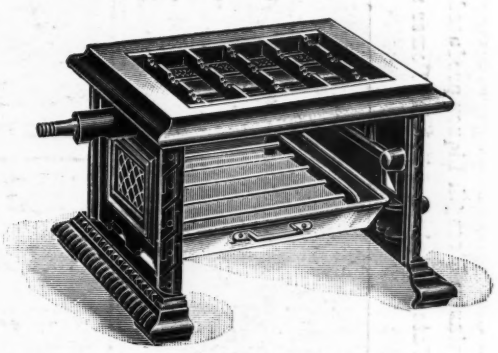

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**RETORT-BENCH IRONWORK, CONDENSERS, SCRUBBERS, PURIFIERS, VALVES, &c.**

DESIGNS AND ESTIMATES ON APPLICATION.

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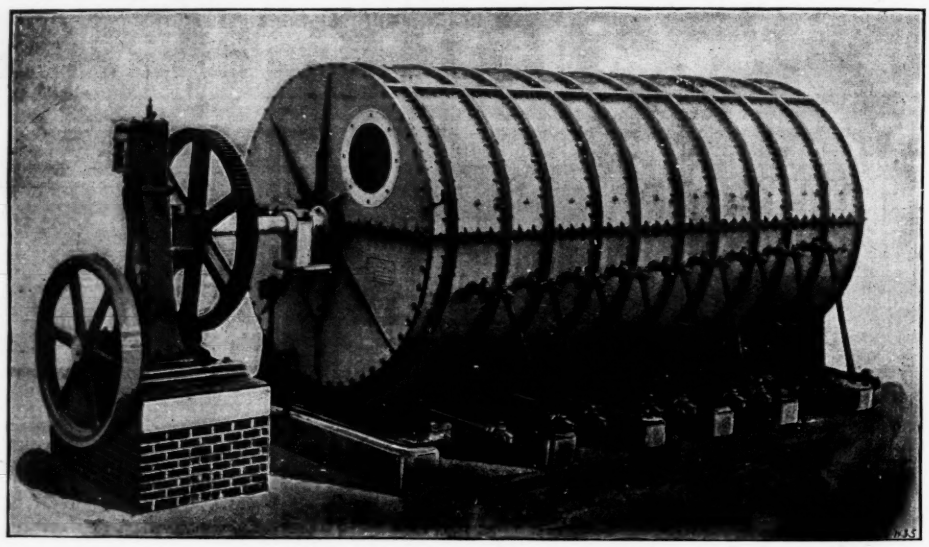
## PATENT "STANDARD" WASHER-SCRUBBERS

**Complete Extraction of Ammonia and large proportion of $CO_2$ and $H_2S$.**

Maximum Strength Liquor produced, Minimum Water Supply and Driving Power required.



Old Pattern Machines fitted with latest Improvements at Small Cost.

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# AT

our own Works, and the Settings also are of our own special design. Go to

# SMETHWICK

and judge for yourselves as to the substantiality of the design, the excellence of the workmanship, the successful working and the beautifully even heats. No creeping of Coal in the Retorts, nor any abominable probing and tickling take place. Note the Measuring-Chambers and the Charging-Shoots, which

# WERE CONSTRUCTED BY

# W. J. JENKINS & Co., LTD. RETFORD.

. . . . SINCE 1893 . . . .

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# CARBURETTED WATER-GAS PLANT

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|---|---|---|---|---|---|
| Copenhagen | 700,000 | Stockton-on-Tees | 500,000 | Hartlepool | 750,000 |
| Copenhagen (Second) | 2,500,000 | Edinburgh | 2,000,000 | Utrecht | 1,000,000 |
| Belfast | 1,700,000 | Guildford | 350,000 | Deventer | 150,000 |
| Belfast (Second) | 4,500,000 | Brentford | 1,200,000 | Portsmouth | 1,000,000 |
| Brussels | 700,000 | Syracuse, N.Y. | 850,000 | Bournemouth | 1,000,000 |
| Brussels (Second) | 700,000 | Bridlington | 125,000 | Aylesbury | 150,000 |
| Liverpool | 3,500,000 | Middlesbrough | 1,250,000 | Hamburg | 1,750,000 |
| Liverpool (Second) | 4,500,000 | Croydon | 1,250,000 | Redhill | 275,000 |
| Tottenham | 750,000 | L. & N.W. Ry., Crewe | 700,000 | Dublin | 2,000,000 |
| Tottenham (Second) | 750,000 | Taunton | 225,000 | Posen | 450,000 |
| Santiago de Cuba | 400,000 | Lawrence, Mass. | 400,000 | Dunedin (N.Z.) | 150,000 |
| Swansea | 750,000 | Commercial Gas Co. | 850,000 | Lincoln | 500,000 |
| Manchester | 3,000,000 | Commercial (Second) | 850,000 | Antwerp | 1,500,000 |
| Brighton | 1,750,000 | Commercial (Third) | 1,250,000 | Brussels | 1,000,000 |
| Preston | 1,500,000 | Rotterdam | 850,000 | Brighton (Second) | 1,850,000 |
| New York | 1,200,000 | Dorking | 125,000 | Stockport (Second) | 500,000 |
| Southport | 750,000 | McKeesport, Pa. | 500,000 | Croydon (Second) | 625,000 |
| Bath | 1,000,000 | G.L.&C.Co., Bromley | 3,750,000 | Maidenhead (Second) | 225,000 |
| Newburg, N.Y. | 350,000 | G.L.&C.Co., Nine Elms | 2,750,000 | G.L.&C.Co., Beckton | 2,250,000 |
| Newburg (Second) | 250,000 | Durham | 200,000 | G.L.&C.Co., Fulham | 1,750,000 |
| Hoylake | 125,000 | New York | 4,000,000 | Tottenham (Third) | 350,000 |
| Coventry | 600,000 | Scarborough | 800,000 | Sydney (Harbour) | 500,000 |
| Coventry (Second) | 600,000 | Perth, W.A. | 125,000 | Sydney (Mortlake) | 500,000 |
| Bordentown, N.J. | 125,000 | Bremen | 550,000 | Manchester (Second) | 3,500,000 |
| Winchester | 200,000 | Maidenhead | 225,000 | Hull | 1,500,000 |
| Shanghai | 225,000 | Epsom | 225,000 | Longton | 600,000 |
| Stockport | 500,000 | North Middlesex | 150,000 | Staines | 600,000 |
| Norwich | 1,000,000 | Wandsworth | 1,800,000 | Commercial (Fourth) | 2,000,000 |
| Holyoke, Mass. | 600,000 | Aarhus | 800,000 | Dublin (Second) | 2,000,000 |
| St. Joseph, Mo. | 750,000 | Falmouth | 150,000 | Faversham | 200,000 |
| Lea Bridge | 350,000 | Southampton | 800,000 | Birmingham (Swan V'ge) | 1,500,000 |
| Lea Bridge (Second) | 350,000 | | | | |

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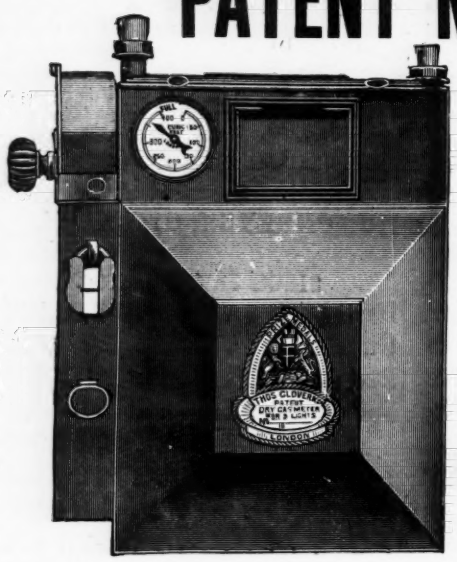

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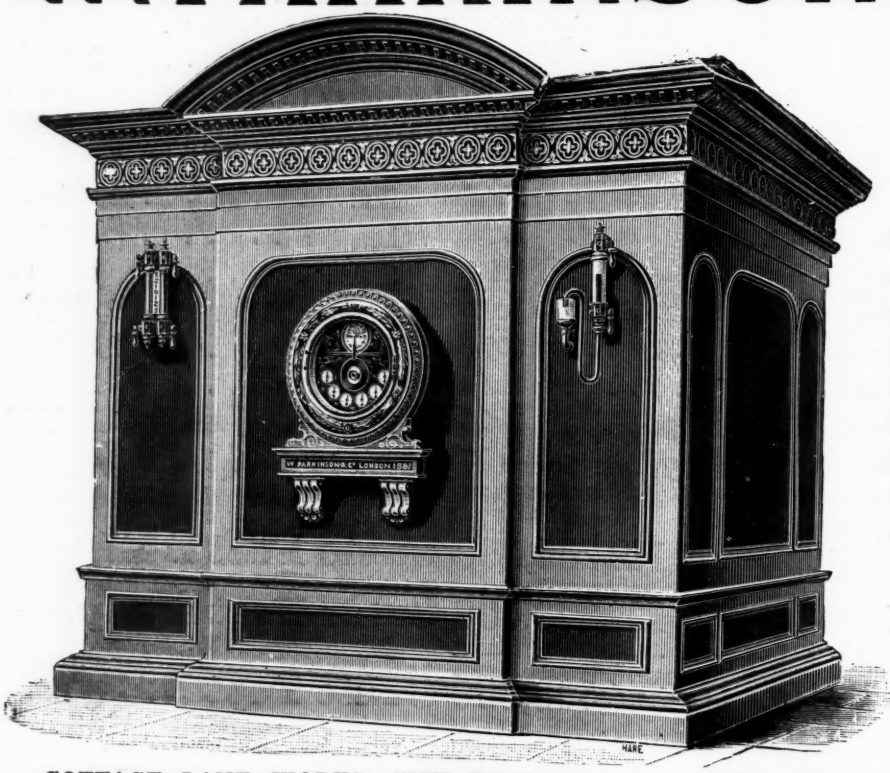

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# EDITORIAL NOTES.

### London Gas in Parliament.

THE work of Parliament last week in relation to gas was very heavy, and of first-rate importance. The Committee to whom the four London Gas Bills have been remitted, Mr. Oldroyd being the Chairman, began with the Bill of the London County Council on Tuesday, and continued the hearing on Thursday and Friday, after which they rose for the Easter holidays. The inquiry will be resumed on Tuesday, the 1st prox. Progress has been made with the development of the promoters' case; but it has not been finished. The objects of the Bill, as most of our readers are doubtless aware, are two in number. One is to make further provision as to testing the illuminating power of the three London Companies' gas, by legalizing the use of a portable photometer; and the other is the regulation of the Companies' slot meter business. The latter question is held over for the present—the promoters having addressed themselves solely to the proving of their preamble relating to the testing of gas; and this is a very serious matter indeed for the parties concerned. The task which the London County Council have undertaken to perform is to satisfy the Committee that the illuminating power of the gas supplied by the Companies in their districts generally "cannot be satisfactorily or sufficiently tested by "tests made only at certain prescribed testing-places;" and, further, that it is expedient, right, and fair that the operations conducted at these fixed stations should be supplemented by "surprise" penalty testings made anywhere with the instrument named, or any appliance of the same character which the Gas Referees may prescribe.

The position taken up by the promoters was defined, with his usual force and pointedness, by Mr. Worsley Taylor, as being nothing more than the statutory ground that the consumers of London have a right to be supplied with 16-candle gas. There is no question that the illuminating power of the gas supply of London has been fixed by law at this figure; but there seems to be a most profound and irreconcilable difference of opinion as to what is the precise obligation laid upon the Companies. The words of the Acts of 1876 and 1880 are that the gas "supplied" by the Company, and in the latter Act with the qualification "at such testing-place," shall be as stated. The controlling authority, now the London County Council, argue that this implies the obligation upon the Companies to maintain this illuminating power in all parts of their districts; and the Companies dispute it. The Council contend that their view of the extent of the obligation is supported by the fact that Parliament, when enjoining upon the Companies the measure of illuminating power, and setting up a Board of Referees to see to its observance, gave the Referees unlimited discretion as to how many testing-stations they might require, and where these should be located. Consequently, the promoters of the Bill think they have only to bring sufficient evidence to show that gas can be found anywhere in the whole of the Administrative County of London which is not of 16-candle power, in order to prove that the Gas Companies are not fulfilling their statutory obligation in this respect. This is the sole alleged justification for the Bill.

Obviously, the claim of the controlling authority is very plausible. It is just the case to catch the popular fancy, merely to plead that the consumer should have the gas the Companies contracted to supply. Also, it looks very mysterious, to say no more, that surprise tests of gas should show, on the oath of reputable witnesses, that, as a matter of fact, while 16-candle gas is being registered in the official way at the fixed testing-stations, outside these places the town's gas is poorer by several candles. If what has already been stated as the controlling authorities' view of the obligation of the Companies is a correct reading of the law, and the obligation is disregarded in this flagrant and "chronic" degree, as the Chairman of the Committee has remarked, it would appear to be the natural inference that the actual system of testing is a delusion and a snare, the Gas Referees weak triflers with their duty, and the Gas Companies barefaced frauds. The reform of introducing a variety of the existing photometrical methods would seem to be a milk-and-watery remedy for so scandalous a state of things.

Happily for a good many reputations, however, there is another aspect of whatever may ultimately appear to be

the facts of the matter. The promoters of the Bill themselves shrink from imputing fraud to the Companies. We cannot discuss the evidence yet given; but, for the sake of those who desire to think well of a number of gentlemen hitherto esteemed as respectable members of society, and no fools in their vocations, it may be suggested that the evidence itself is open to the interpretation that there must be a question about the obligation. It is to be regretted that the promoters have not had the courage of their opinions. If what Mr. Worsley Taylor says is the law, and the facts are to be interpreted in the light of it, then there should be no squeamishness about drawing the logical inference. But the Companies, so far as can be gathered from incidental observations of Mr. Pope and other Counsel, challenge the promoters' reading of the Acts of Parliament. London is to be "supplied"—the testing-stations are to be supplied—with 16-candle gas. What is 16-candle gas? And why testing-stations for ascertaining whether this so easily-said requirement is satisfied? Whether it is the law or not, the sense in which persons "having practical knowledge and experience in the manufacture and supply of "gas," such as were originally held to be peculiarly eligible for the office of Gas Referee, understand the word "supply" in this connection, is to "furnish." That is to say, gas of this quality must be sent into the town. Even Mr. Worsley Taylor admitted that there might be conditions, as "dead-ends" of pipes, where it would be unfair to test the gas "supplied;" but this is to open a door that cannot be swung by degrees. It must be either open or shut. Mr. Vernon Harcourt, as was to have been expected, told the Committee that the extent of the Companies' obligation is a matter for dispute. Obviously, if testing for illuminating power is to be co-extensive with the consumers' internal gas-fittings throughout the whole of London, then 20 or 20,000 fixed testing-stations would be inadequate to give the consumers the "protection" which such institutions are capable of affording.

Enough has been said to inform our readers of the enormously important issue which Mr. Oldroyd's Committee, in the first place, are called upon to try. Parliament is powerful; and if it chose, it could enact that if a barrel of ale or a jug of milk turn sour in any house, then the brewer or the milkman, as the case may be, shall answer for it. But the Bill for making so valuable an improvement on the ordinary conditions of dealing in perishable commodities would need careful drafting to prevent its operating in restraint of trade and to the increase of the price of necessaries of life. The London County Council Bill is *not* a Bill to increase the price of gas; but some of the witnesses who have supported it professed complete indifference to such a consideration. At this time, too!

### Bradford Gas Politics.

THE Bradford Corporation Bill has been in Committee all the week, and the proposals relating to gas have been keenly criticized. In the event, the Committee left the matter in suspense over the holidays, in the hope that the parties would agree, and so spare Parliament the painful proceeding of ordering compulsory expropriation. This is the long and the short of the matter. Bradford is a Municipality driven by circumstances to expansion, which has already gone far, and to which there is no apparent limit. It so happens that, incidentally to this continuous growth of the borough, there is unavoidable trespass upon a number of suburban districts hitherto supplied with gas, more or less profitably, by local Gas Companies. Many large centres of population are differently situated in this regard; but in the neighbourhood of Bradford, for economic reasons, gas is and has long been supplied by several isolated Companies with no common bond among themselves, and certainly with no relationship to Bradford. Last year Bradford went to Parliament with a scheme of partition for certain of these undertakings, which failed to enlist the sympathy of the Legislature. It was proposed to take only such portions of these properties as actually lay within the borough limits for the time being; but the difficulty of buying pieces of a gas undertaking at a fair value, and the sentimental objection to the principle, constituted a stumbling-block. Learning by experience, Bradford this year has proposed to purchase outright such of the undertakings as it coveted; and in some cases this proceeding was not seriously objected to. On the other hand, certain Companies did object; and Bradford was rather ill-advised in trying to "rush" the Committee into a belief that the compulsory expropriation of gas companies is one of the commonest of municipal experiences. Consequently upon this strategical blunder, matters did not progress very smoothly. The Committee exhibited a remarkable spirit of hostility to anything that might look like an intention on the part of Bradford to reduce the outlying gas undertakings to a "scrap value;" and accordingly the ardent Municipality had to go slow. In all probability, the parties will return to the scene of what at one time looked perilously near to a desperate misunderstanding, with an agreed programme which the Committee will sanction without difficulty. Meanwhile, it is a distinctly satisfactory reflection that Parliament is very properly jealous for the rights of small and poor suburban Gas Companies threatened with rivalry by big inner centres of population. It is natural and inevitable, of course, that large and growing municipalities should extend their protection, and also their government, over the inhabited regions to which their boundaries approach from time to time. An independent suburb, especially if it is of an industrial character, is apt to be a place where noxious trades are carried on, and many things permitted which the better-governed centre does not sanction. At the same time, the suburban Gas Companies, although their circumstances may never have been very fortunate, have kept the light of gas going when no better service was to be had; and they deserve fair treatment when their day is past. We do not charge the central municipalities with conscious oppression of these outlying and sometimes indifferently successful undertakings. But they have their point of view; and it is not always possible for them to rely upon the support of their own ratepayers in doing spontaneously what Parliament will certainly require when all the facts are known.

### The Meeting of the Commercial Gas Company.

THE Commercial Gas Company held their ordinary general meeting on Thursday, when the Chairman, Mr. J. Blacket Gill, had a satisfactory tale to tell of business increasing at a rate which a few years ago would have been regarded as beyond the possibilities of the Company's situation. After briefly setting forth the results of the past half-year's working, the Chairman had to make a clean breast of the new state of the Company's affairs consequent upon the doubling of the price of coal. He boldly, and as we are inclined to think very wisely, took the step of announcing an increase of 6d. per 1000 cubic feet as from Lady Day. True, the South Metropolitan Company are only raising their price by 3d.; and the Chartered have not made any general announcement. But the facts are plain, and they cannot be denied. Everybody knows that coal is dearer; and nobody will expect Gas Companies to work miracles. Companies with large reserves may elect to temporize until they see what warmer weather will do. There was a brief time, we must confess, when we fondly believed the price of coal was about to topple; but the cold weather and foreign greediness for English coal at any price hardened the market again. If the price of gas must be raised on this account, it will be a mistake to make two bites of the cherry. Besides, the second might have to be taken at a season of the year when the householder does not burn coal, and consequently has not the higher price brought home to his inner consciousness. Another important incident of Thursday's meeting was the unanimous adoption of the Directors' proposal to sacrifice the right to issue the remainder of the capital stock of the Company at par to the proprietors, and to sell it by tender or at auction. The Board and the Company generally are to be congratulated on their statesmanlike decision, which will strengthen them enormously if they should ever have to defend themselves against an enemy.

### The Wandsworth Building Act Case.

THE Wandsworth and Putney Gas Company have failed to maintain their legal position in regard to the London Building Act, as stated by the Metropolitan Magistrate before whom they were summoned by the London County Council, as reported in the last volume of the "JOURNAL" (p. 1251). It was a case of building over the frontage-line, as defined by the Act, of a by-way near the river; and the question of law was as to whether the Company's Private Acts empowered them to contravene the public enactment in this regard. The Magistrate said "Yes;" and now the Divisional Court have said "No." Our report of the hearing by the higher Court is worth studying as a lesson in the mutual bearing of General and Special Acts. It is

not surprising that the Court should have come to the conclusion now recorded. Rather was it remarkable that the Magistrate found the other way. The present decision is more in accord with others of older date. The only important question in such cases is which is the first and chief obligation. The judgment draws a sharp distinction between the statutory powers of a Gas Company for erecting such works "as" they think fit, and the General Acts which may forbid them to erect the works "where" they please. You may build gas-works under the powers of a Special Act, but the work must not be done regardless of every other—and possibly conflicting—law of a superior order. This was the moral of the Hull gasholder case also. There does not appear to be any room for a different rule. In this Wandsworth case, there were particular considerations which, as the Court allowed, rendered the elucidation of the general principle difficult; while the hardship to the Company of being prevented from putting their own land to the only use for which it is of any good to them is patent.

### Informal Meeting of Scottish Gas Managers.

It is questionable whether a greater surprise is in store for gas managers this year than will be experienced on reading the announcement made at the customary Informal Meeting held in Glasgow last week, of the almost wholesale conversion of gas managers in Scotland to the policy of supplying low-grade gas. It is but a few years ago that the only tangible movement among managers on the other side of the Border was towards enrichment, with a view to keeping the illuminating power of the gas at the high standard which has always prevailed in Scotland. Mr. T. D. Hall, of Montrose, was the only one who ventured to express an opinion favourable to low-grade gas; and his was as a voice crying in the wilderness. The support he received was not merely scant; it was *nil*. When, however, at the Informal Meeting in Glasgow last Wednesday, Mr. J. W. Carmichael, of Barrhead, in his very thoughtful and well-reasoned presidential address, gave his opinion as being in favour of a reduction in the standard of illuminating power to at least 20 candles, the managers present seemed almost to tumble over each other in their haste to announce their adhesion to the President's views—some going down as far with their proposed standard as 15 candles. Mr. James M'Gilchrist, of Dumbarton, the doughty champion, for many years, of high-grade gas, while not joining in the consensus, was obliged to admit that circumstances have changed, and that the maintenance of a high illuminating power is now of less importance. It is probable that Scotsmen were, in time, bound to come to the view which was almost the unanimous feeling of the meeting. What surprises is the suddenness of the adoption of the new front—not to call it change of front, for there is nothing to indicate that the new doctrine may not have been held by many in secret, though not divulged, seeing that the "circumstances" did not require it. But the probability is that the circumstances have developed rapidly, and that the new doctrine is in reality new with many who now hold it firmly. One of these circumstances has been the great expansion of the use of gas fires and cookers; and another has been the popularization of incandescent gas lighting—for both of which uses a poor gas is quite as good as a rich one. But the prime-mover has been, of course, the great rise in the price of coal; and we all know that it has taken, not only gas managers in Scotland, but the whole world (outside coal circles) by surprise. This is a truism; but there is hanging on, as it were, to this matter of dear coal, the feeling that we may be nearer the exhaustion of the richer coals for gas making than has hitherto been believed. This view was almost, indeed, openly expressed at the Informal Meeting. So far from this not being the probable state of matters, it is by no means improbable, because coalowners, though they might form a ring, and raise prices for a time, could not eliminate a coal from the market so effectually as to convince a whole industry that it could not be got. Were it possible to entertain the opinion that this is what has been done here, then the other view arises, that the coalowners will have overdone their part, and that there will very speedily be a reaction. The subject is one not to be lightly put out of mind. The exhaustion of first-class cannel would have a far-reaching effect upon the manufacture of gas. The Scotch managers probably spoke under the influence of panic; but they are not the likeliest people to be led away by any such reason. That they have been led away is probably the weightiest reason why the whole subject should receive early and earnest attention. This matter overshadowed every other. It is, however, a great pleasure to learn that the meeting was unusually well attended; that the President gave an admirable address, introducing many subjects for discussion; that the discussion was largely taken part in; and that the speaking was of so high an order. There is a "shoulder-to-shoulder" feeling in the whole proceedings that is quite refreshing.

### Coal and Iron Profits in 1899.

In a recent issue of the "Economist," there was a very interesting tabulation of the dividends declared by the principal colliery and iron and steel companies of the United Kingdom during 1899, compared with those paid during the previous nine years. The table is eloquent of the prosperous times through which these industries are passing; the dividends declared last year being, with only a few inconsiderable exceptions, at much higher rates than had been earned in recent years, though not in any but a very few cases exceeding those paid in 1890—the crowning year of the previous period of prosperity. As is observed, however, dividends alone give only a very general indication of the character of a year's working in the case of collieries and iron-works, as the question of provision against depreciation is in their case of the utmost importance. An examination of the reports of some of the principal undertakings affords striking proof of the great prosperity enjoyed by the coal, iron, and allied trades last year; the sums written off for depreciation, and expended on extensions of works and plant, amounting in several instances to more than the dividends distributed. We may give one instance of a colliery's and one of an iron-works' profits during the year: (1) The Welsh firm of D. Davis and Sons not only paid two years' preference dividend, amounting to £12,000, out of the profits for 1899, but also cleared off a debit balance of £16,844 brought forward from 1898, redeemed £40,000 worth of debentures, placed £10,000 to reserve, and paid 8¾ per cent. ordinary dividend—or equal to £49,375. (2) Messrs. Bolckow, Vaughan, and Co., out of their profits last year (calculated after providing for depreciation) bought a complete iron-works for £215,000, and spent £48,135 on other extensions and new plant, besides distributing an ordinary dividend amounting to £219,704. Other instances could be multiplied; but the two given are sufficient to demonstrate the fact that, for shareholders in coal and iron companies, 1899 was a golden year. The effect, so far as holders of gas stocks are concerned, is unfortunately likely to be the reverse of satisfactory during the present year; and the outlook is not lightened by the fact that most of the reports referred to above speak of the future as "very promising"—it being anticipated that the close of the war will be followed by a demand for iron and steel goods sufficient to ensure the continuance of activity at least for the remainder of the current year. The prices of meters, stoves, and fittings are already being raised by the makers; while machinery and constructional ironwork jumped up months ago, and have not shown any signs of falling. Proprietors of gas stock must resign themselves to the inevitable, and wait for easier times.

### The Liability of "Undertakers" and Contractors under the Workmen's Compensation Act.

Just before Parliament rose for the holidays, the Leader of the House of Commons took an opportunity, while answering a question, of repeating the opinion expressed by the Home Secretary that the amendment and extension of the Workmen's Compensation Act will not be long delayed. Oddly enough, this declaration has been pounced upon by a newspaper more or less identified in politics with the Opposition, and used as a "stick" for the belabouring of the Government in general and of Mr. Chamberlain in particular. The political motive of this is tolerably obvious, but does not concern us. What does interest our readers, however, is the onslaught which some newspapers and politicians continually make upon those employers who are constrained to seek the protection of the Appeal Court against what they regard as miscarriages of justice in the Courts of First Instance. This is done by picking out a few doubtful cases, in which the employer has either lost or has been made to figure as a hard man, and exhibiting them as proofs that the masters are set upon taking "every "possible point, good, bad, or indifferent." The testimony of representative employers and workmen that the Act, as

a rule, works well, and with remarkably little friction, goes for nothing against such prejudiced statements.

When the Act has been amended, and extended to the fullest practical limits, there will still be some litigation—perhaps more than ever; because most of the appeals at present are upon questions of limitation. Give every workman the benefits of the Act, and it will still remain to be decided in numerous instances who is a workman, when he is doing his proper work, and who shall pay him his compensation. It is a simple faith that some people seem to have, that an extension of legislation in any direction will ever tend to reduce litigation. Quite the contrary result is to be expected. One of the latest of the appeals out of which it has been sought to make a grievance, is a case in which a painter, working for a general contractor for building repairs, failed to recover from a Railway Company for injuries he received from an engine. The man was working at a railway station when he was hurt; and he sued the Company under section 4 of the Act, which makes the undertaker liable to men working for a contractor. This enactment, as is notorious, was made for the purpose of getting over the difficulty of sub-contracting, which it does completely. At the same time, however, it was provided that the section shall not apply to men engaged in merely ancillary or incidental work, which does not form a part of the ordinary business of the undertaker. Here, again, the object of the Legislature is conspicuously clear. It is designed to meet cases of the very kind in question, where the men work for a contractor engaged in another line of business altogether from the undertaker.

The point is of great importance for gas companies and all "undertakers," in the language of the Act; because without it every man working for a contractor for ordinary building or engineering work and repairs would have a distinct claim, not on his own master, but on the master's employer. "The practical consequence of the "decision is that no railway company can be sued "under the Act by workmen not in their own immediate "employ." That, of course, depends upon circumstances. These sweeping generalizations are extremely dangerous, where the interpretation of an Act of Parliament is concerned. The case of *Pearce v. London and South-Western Railway Company* is quite valuable and significant enough as it stands; and those of our readers who are interested in the matter, are not likely to misunderstand it. Much of the litigation that has occurred under the Act is due to attempts to put the saddle on the wrong horse; and although it is possible to sympathize with the hard cases that inspire this attempt to make bad law, the line of responsibility must be strictly drawn, in the interest of the workpeople themselves. Meanwhile, a prudent undertaker may feel justified in taking some assurance from his contractors that he shall not be liable to be thus gibbeted.

## WATER AND SANITARY AFFAIRS.

THE proceedings at the meeting of the East London Water Company last Thursday consisted practically of the address of the Chairman, Colonel Lockwood, M.P. It was shorter and of a more cheery character than the one he delivered this time last year, when, owing to the retirement of Mr. Banbury, he had to present to the shareholders an account of the difficulties through which the Company had passed owing to the extraordinary drought of the previous summer. That those difficulties should have pressed so heavily upon the Company was in large measure due to the persistent opposition of the London County Council; and that they were eventually removed was the result of the policy adopted by the Directors, and of the untiring service of the Engineer and other officials. Colonel Lockwood's first address was a masterly vindication of the course pursued by his colleagues; last Thursday's was couched in somewhat different terms, owing to the changed circumstances. True, the Company had had to bear the great strain of yet another period of drought; but thanks to the intercommunication scheme, they came triumphantly through it. During the whole of the long spell of dry weather last year, a continuous supply of water was furnished throughout the Company's district. But at what cost? Nearly £31,000. This large sum was expended in the purchase of water from other Companies; and the effect upon the accounts for the half year was to leave only £359 to be carried forward, after the payment of the dividend. No shareholder rose to complain of this outlay, as it was manifestly necessary in order that the needs of the 200,000 consumers in the Company's extensive area should be fully supplied. In fact, if the additional expenditure entailed by the drought had compelled the Directors to recommend a slight reduction of dividend, it would no doubt have been agreed to, in view of the satisfactory results which had attended it. For, notwithstanding all attempts to sow discontent among them, the consumers are beginning at length to realize that water delivered in their houses for a trifle over 4d. per 1000 gallons is not a very dear commodity; and the consequence is that the relations between the Company and their large body of customers are now of the pleasantest character. The Directors are naturally gratified at recognizing this happy result of their policy; and their feeling is evidently shared by the proprietors. It was not to be supposed that Colonel Lockwood would pass over the report of the Royal Commission; but as the Directors regard it as most satisfactory, he did not dwell upon it. He, however, very properly pointed out that, while the cost of the incessant agitation kept up against the Water Companies is in one case spread over three-quarters of a million of ratepayers, and therefore is not felt individually, in the other it comes in a concrete form upon the parties attacked. It cost the Company last year nearly £6000 to defend themselves against charges which, as in the cases of the other Companies, had always been disproved when investigated by an impartial tribunal. But comparative peace may be now expected.

It is to be hoped that no water engineer will have to pass through such a time of anxiety as did Mr. W. J. Ware, the Engineer of the Maidstone Water Company, on the occasion of the serious epidemic of typhoid fever with which that town was visited towards the close of the summer of 1897. But should his district ever be similarly afflicted, he will do well to profit by the experience gained by his colleague, as recorded in the paper read at the meeting of the Society of Engineers on Monday last week, and given in abstract form in another column. It may be remembered that very shortly after the outbreak, Dr. G. Sims Woodhead was called in to make a thorough inquiry into the matter, and advise the Company as to the cause of the epidemic, and as to what steps, if any, should be taken to prevent its increase. The conclusion was arrived at that, if the water had anything to do with the dissemination of the disease, all that was necessary was to sterilize the reservoirs and mains in which the high-pressure water was collected and distributed. After a careful study of the method of sterilizing with dilute milk of lime, as carried out, under the advice of Professor Dewar, at Worthing, and comparing it with experiments made with the various chlorine compounds, it was decided to fill the mains and service-pipes with a quantity of chloride of lime solution of about 1 per cent. strength. The total length of mains in the high-pressure area was 25,937 yards, and their capacity rather more than 76,000 gallons; and the way in which their disinfection was carried out is indicated in our abstract. Those who desire additional particulars will, of course, consult the full text of the paper, which, accompanied by a map, will appear later on in the Society's "Transactions." It is the combined production of Dr. Sims Woodhead and Mr. Ware. The result of the treatment adopted was the removal of all possibility of the continued existence of any typhoid organisms in either the mains or the service-pipes. In fact, the authors were satisfied that no micro-organisms of any form that could have obtained access to the pipes from the high-pressure service could remain alive. The reason for deciding upon chloride of lime was its great efficacy as a disinfectant and its comparative cheapness. As shown by the paper, it answered admirably in this respect. The only drawback to its use was its destructive action upon the leather washers of the taps and valves, as well as upon the articles of clothing worn by those who carried out the operations. Apart from this, however, no ill-effect was traceable to the employment of the chlorinated lime solution. The paper is of special interest from the fact that it records the results of a thoroughly successful experiment in the disinfection of a water-distributing system on an unusually large scale, and in the face of many difficulties; and the thanks of water engineers and sanitarians generally are due to the authors for preparing it, and to the Council of the Society of Engineers for enabling them to bring its subject-matter before those who are likely to profit by its publication.

# ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 959.)

BUSINESS on the Stock Exchange was not very good last week. Such activity as there existed was limited closely to one or two lines (the American being again the busiest), while most departments were decidedly dull. The approach of the settlement and the ensuing Easter break caused a considerable amount of realization and closing down for the holidays, and took the top off some of the advances in value which had been run up. So that in result few prices have gained much by the week's operations, while a good many are decidedly the worse. The Money Market was very easy, especially in the earlier portion of the week; and discount rates also fell at once, though they hardened up before the finish. Business in the Gas Market was more abundant than in the preceding week. Movements in value have naturally been adverse, as was pointed out last week. The announcements made during the week of unavoidable increases in the price of gas have prepared shareholders for a reduction in the dividends to be declared for the current half year. And, in the case of those foreign undertakings whose concessions bind them down to a price without the power of raising it, the increased cost of coal will probably work a similar reduction. Each of the Metropolitan Companies was more or less affected. In Gaslights, the ordinary opened at about 105½, and stood to it steadily until Friday, when a sharp fall set in, and 102 was marked; the quotation dropping a couple of points. The secured issues also weakened; but only the debenture receded. South Metropolitan was similarly moved. After touching 137½, it fell on Friday, and the closing mark on Saturday was 134; but for some reason the quotation was not varied in accordance. Commercials were very lightly dealt in, and had a moderate fall. At the Company's meeting on Thursday, the Chairman announced an increase of 6d. in the price of gas, which will take 1½ per cent. off the authorized rate of dividend. But the most important incident was a resolution that all future capital shall be raised on the cheapest possible terms. This strengthens the Company by removing a source of weakness which has handicapped them in the past. Suburbans and Provincials were very quiet; and they, too, underwent the lowering treatment—Brentford and Brighton receding. Among the Continental Companies, European and Union were the most freely offered, and commanded only easier figures. Imperial was unchanged. The remoter undertakings were unaffected. Business in Water was much the same as usual; and here too lower prices ruled.

The daily operations were: Business in Gas on Monday was mostly in Gaslights at the old prices. Brighton original fell 2; and European ½. Things were very quiet on Tuesday. Continental Union moved back 5. Wednesday, too, was rather inactive; and Gas quotations were unchanged. In Water, East London fell 2. Thursday was no busier; and prices were still shrinking. Brentford old relapsed 4½; and Brighton original 3. Friday was the most active day, and had most changes. Gaslight ordinary dropped 2, Commercial old 3, ditto new 5, and South Metropolitan ½. Saturday was very quiet; but Gaslight debenture fell 1, and Brentford new 3. In Water, New River was 2 lower.

## COAL PRICES AND RAILWAY RATES.

THE abnormally high prices which are, and for months past have been, ruling for coal and all iron and steel goods, are having far-reaching effects upon industrial economics generally, as was, of course, inevitable from the fact that the trade in these commodities forms the backbone of the commerce of the country. With their immediate effects on the gas industry, our readers are only too familiar from actual experience. Their influence upon another group of undertakings to which coal and iron are vital necessities is already beginning to make itself manifest. We refer to the Railway Companies, who may be said to be born of iron, and kept alive by coal. As with gas companies so with railways, owing to the contract system for obtaining coal supplies, the increased prices which fuel has reached during the past winter are only now beginning to take full effect; yet, speaking at their recent half-yearly meeting, the Chairman of the Great Northern Company said that "the increase in the price [of coal] during last year represents about ½ per cent. on railway dividends generally." In other words, an increase in the train mileage of less than 5 per cent. had been accompanied by an increased charge for fuel of about 22 per cent. over 1898, while wages and materials—largely metal goods—also rose to an extent out of proportion to the increased business. As the coal contracts will have to be renewed at much higher prices, and materials continue dear, the working expenses of the railway companies this year will inevitably be heavier than during 1899.

Apart from its general interest, this prospect is of direct concern to the gas industry; for it is obvious that the railway companies will endeavour to provide for this expanding cost of working by raising their rates for the conveyance of goods and passengers. They would, further, be more than human if they did not endeavour to get back some of the cost of their fuel by means of a higher impost upon the carriage of coal. Fortunately, as we said last week, the suggested addition of 3d. per ton to the rates charged for the carriage of coal from Scotland and the North to London has not as yet been imposed, owing to the opposition of the London and North-Western Company; but other increased charges are reported to have been agreed upon, which must of necessity add to the cost of carrying coal from the pit to the consumer. The charges for weighing coal, and for the hire of coal waggons, are to be raised; as also those for delivering coal and coke to blast furnaces; while additions are to be made to the present rates charged for rent of sidings, demurrage, &c. What increase in the cost of carriage per ton of coal these changes will entail, it is impossible at present to say. But one thing is certain, which is that whatever the increase may be, it will fall upon the consignee rather than upon the colliery. The railway companies will, therefore, in effect, be shifting some of their heavier fuel bill on to the shoulders of those who are already suffering from the abnormal price of coal.

In commenting at length upon the steps which are understood to be in contemplation by the railways, having for their object the approximate maintenance of dividends, "The Times" speaks of these companies as preparing to "enter upon a doubtful and dangerous course of policy. They cannot," the writer proceeds, "afford to place themselves in an attitude of indifference, if not hostility, to public opinion, or to encourage the growth of such a feeling as that which prevails in the United States against the working of monopolist corporations. Hitherto, they have, on the whole, shown much good sense and moderation, sometimes under rather trying conditions. But they must not forget the lessons that experience has already taught them. They must bear in mind that to strain legal rights up to the highest permissible point, and to ignore long usage and general understandings, is not the part of practical wisdom." Therein is much sound common-sense; but it appears to us that the policy outlined in the article quoted, scarcely falls within the category of "doubtful and dangerous." We naturally regret that the policy entails a further burden upon the coal buyer; but it is impossible to contend that the shareholders in the great railways of the kingdom—who have never received extravagant dividends—should, any more than the shareholders in gas undertakings, be expected to bear the full cost of the abnormal condition of the coal and iron trades. That cost must inevitably spread itself over the bulk of the inhabitants of this country. Whether the prices now ruling in those trades can then be maintained will depend entirely upon the extent to which those prices are due to lasting or to temporary prosperity of trade in general.

## ARCHITECTS ON THE BUILDING OF SMALL HOUSES.

IT is a coincidence that within a month of the first appearance of the "JOURNAL" essay of Feb. 20 last, entitled "In the Cause of Intelligent House Building," Mr. C. E. Bateman, of Birmingham, contributed a paper on "Small Houses" to the Architectural Association. The paper, which was illustrated by many plans and elevations of houses built by the author, chiefly in Warwickshire, was published in the "Builder" of the 17th ult., with a good report of the discussion. Those of our readers who are interested in the subject should not fail to procure this number of our contemporary. The author recognized that his auditory was composed of brother professionals, and as such "knowing all about domestic architecture." It is to be hoped that there was no satire hidden in the observation; but we are not sure of this. Mr. Bateman himself started his statement of works accomplished from what he called the "lower limit" of a dwelling-house costing £750 to build, and letting at £45 rental. This is altogether beneath the scope of London architects, one of whom admitted in the discussion that "there was not the slightest chance of competing with speculative builders in London, because the £750 house, which Mr. Bateman had referred to, if built by the speculative builder, with the same number of rooms, possibly larger, could be bought for £450." That is an acknowledgment of the truth of the impeachment of the profession of the modern architect contained in our February article—that the vast bulk of the dwellers in houses of from £25 to £50 rental have nothing to hope for from architects; but are left to the tender mercies of the speculative builder, who has the house "market" all to himself.

Let us pause for a moment to ask whether this state of things in the house building trade is right. We make bold to declare that it is not; inasmuch as it deprives the small householder of these times of all the benefits, of every kind and degree, which the accomplishments of the architect might confer upon him. The householder—90 per cent. of him—is subject to the unrelieved commercialism of the speculative builder; while the professional architect has no interest in the suburb except as providing a site for a new church, and a Board school or two. Modern architecture does not clear itself of responsibility for this exclusiveness, by giving the speculative builder best, as was done at the recent meeting of the Association. Why has the tradesman been able to dispense with the architect? Architecture itself he cannot escape from. The worst speculative builder who ever spoilt a green field with bad brick boxes must be as much of an architect as his necessities and resources,

mental and material, permit. As soon as he has the smallest opening for it, the builder blossoms out with pathetic tributes to the call of human nature for art. Not knowing, his results are usually deplorable; but this is not his fault.

The root and origin of the evil lies in the modern and artificial separation of the occupations of building and architecture. There ought never to be another "articled pupil" in the profession. If the architect cannot stoop to the service of the mass of the community, as the builder does, let him begin as a builder himself, and so learn how it is done by actually doing it. Something like this seems to be in vogue in provincial practice; and Mr. Bateman was able to talk of architecture as a study not restricted to mouldings and sky-lines. It is refreshing to read his straightforward defence of the place of the architect in house-building. He knows the speculative builder, too; but his idea of this person is of a "genius" who is able to get more than 6 per cent. on the outlay on building. For himself, he appears to be able to maintain his own position as the professional adviser of those who are content to build for 5 or 5¼ per cent. This disclosure seemed to be a revelation to the London architects he addressed, one of whom was humorously inclined to commiserate with the Birmingham professional because "the London architect whose houses cost 10d. per foot received half as much again in fees as did architects in Birmingham and the Midlands at 6½d. or 7d. per foot." But if the Midland professional gets two or more commissions to the London man's one, which is the better business? And the point for the consideration of the "profession" is that, whereas people wishful of building houses for themselves, or for investment, at a reasonable and remunerative outlay can go to the Bateman type of architect with a confident hope of getting what they require, the usual London professional owns his inability to work within twice the cost that pays the ordinary tradesman.

Our interest in the subject was sufficiently expounded in February. Small house occupiers are gas consumers to a man, where a supply can be had; and if there were higher intelligence directed to the provision of such dwellings for the enormously increasing suburban populations of the United Kingdom, the advantages of gas would be much more freely enjoyed by those who are ready and willing to pay for them. As it is, to whom should the most enterprising of our gas distributing engineers address himself, in order to explain how greatly the familiar "servant difficulty" can be minimized by the adoption of gas for cooking and heating? The architectural gentlemen have nothing to say in the matter; and the speculative builder is more concerned to let his houses than to make them economical to keep afterwards.

Mr. Bateman is almost alone in insisting upon the advantage to an architect of having to study economy. As we have remarked, this is one of the best and strongest of all influences to produce good engineering; but Mr. Bateman is bold enough to declare that "more houses are spoilt by having too much money badly spent upon them than too little." This is a great truth, and opens up the prospect of getting good work done at a reasonable outlay. It is not our intention to follow Mr. Bateman's remarks, nor to uphold his own practical applications of his architectural ideas. His paper is a capital exposition of the things a house designer should think about beforehand; and many of his ideas and suggestions are very good. His practical mind is shown in the remark that Willesden paper is a good substitute for boarding on roofs. This particular suggestion leads one to mark one reason why the speculative builder is able to beat the professional architect as a cheap constructor. It is that, always having his hand in, he knows better what materials come cheapest and most advantageous to himself season by season. If the architect were as thoroughly up to his work as the builder is, he, too, would have this kind of knowledge, and would apply it to his client's advantage.

It is scarcely a digression; but to prove how completely some professional architects are out of the way of builders' business, the present writer knows of an instance where an architect, having planned a house for a friend, told the latter that if he could find a respectable builder to estimate for the building to his own specification, the job would probably cost 30 per cent. less than it would on the architect's specification, and still be quite as satisfactory.

A valuable observation, in which Mr. Bateman is supported by the Editor of the "Builder," is that there is not much to be learnt from the study of old and "picturesque" houses in respect of bedroom planning or even construction; while sanitary arrangements are, of course, distinctively modern. The seduction of half-timbered elevations is particularly dangerous. There is much reason for the complaint that "architects, even when they can see that such methods as half-timber are anachronisms, seem to be still afraid of making use of modern materials in country houses still in pursuit of some imaginary picturesque." An obvious illustration of this weakness is the shyness of architects towards steel joists and coke-breeze concrete, as modern aids to good building. Mr. Arnold Mitchell approves of this method of construction as a means of preventing the smells of the kitchen from penetrating to the upper rooms. Even the ordinary fir joists can be filled in with coke-breeze concrete, with good effect. Curiously enough, not one of the architects who took part in the discussion of Mr. Bateman's paper mentioned the pioneer work of another Birmingham man, the late Dr. Lawson Tait, in the adaptation of gas-fires to dwelling houses; although there was much said as to the sufficiency of 9-inch pipe flues for chimneys.

A remarkable side-light was thrown in the course of the discussion on the bent of the professional architectural mind, by some complimentary references to the work of Mr. Nesfield, who was qualified as "one of the first designers of the century." This gentleman, on being asked "where he got his motive for his Queen Anne buildings," is reported to have replied "from the Sussex farmhouses." Alas! the ordinary suburban resident does not live in the reign of Queen Anne; nor are his surroundings those of Sussex Down pastures. Why should domestic, like church architecture be ever "Looking Backward?" Let it be accepted that the good master-builder is a man of his own time—an age of steel, concrete, steam wood-working, good bricks, ample sheet glass, the water-closet, the bath, the circulating boiler, and gas. It is for the architect to redeem the use of these things by the saving grace of art; and it is both cheap and cowardly to shuffle off the responsibility by affecting to ignore their existence. Different aspects and branches of this study of practical building construction on modern lines have been dealt with from time to time in the "JOURNAL." We welcome all worthy contributions to the advancement of the art and industry of house-building, including the paper of Mr. Bateman and the observations of his critics; and hope the best for the practical realization of the aspiration of the Editor of the "Builder," that the desirable homelike effect shall be produced "with the best modern materials and construction."

In this respect, satisfaction may be felt at the growth of the fashion of doing away with the bad old method of building houses with hollow spaces everywhere which can never be got at or cleaned out. Solid brick walls, solid breeze concrete floors, solid skirtings, solid partitions, solid framed windows, tight roofs—all these possibilities of modern building construction are to be accepted, not with a groan because they are not "Queen Anne," but gratefully and enthusiastically as gifts of modern science to the genius of architecture. Mr. Statham says truly that what is interesting and picturesque to us moderns in the work of the old artificers was not recognized as such by the men who built it. They simply did the best they could with the means they had at hand; and if we wish to emulate them it will be done not by slavishly copying their performances, but by working in the same spirit. House-building in steel and concrete can be as pleasing to the eye as any work in less excellent materials, if it is inspired with a true feeling for art; and where this does not exist, it is only a mockery of it which so-called architectural "learning" is competent to supply in its place.

Some gentle advice was given at the architects' meeting about the proper placing of outdoor and indoor pipes, for different purposes. Rain-water pipes were discussed with greater confidence, because there is plenty of "authority" for the due treatment of these appliances of civilization; but most of those who mentioned indoor piping did so with bated breath, as those who consented to the perpetration of a convenient iniquity. Why should not the convenient location of telephone wires be as well studied by living architects as the gas and water pipes that have been indispensable in houses these fifty years, but which the ordinary architect is not at home with even yet? Where is the practising architect who has mastered the fact of the enormous convenience of a domestic telephone service for all but the very smallest houses? It would be hard to say which is the less open to the reception of fresh ideas in building—the matter-of-fact speculative builder, or the architect so highly educated that his learning and his taste have become a "temperament." This is a great pity; and, as Mr. A. T. Bolton said at the meeting, it would be much better if young architects would devote themselves to the improvement of house-building on strict commercial principles, instead of preparing ambitious competition drawings which would come to nothing. After all, a suburb of good houses is a better monument than a half-finished church.

**Professor Lewes on Incandescent Gas-Mantles.**—Early in the present session of the Society of Arts, arrangements were made by the Council for the delivery by Professor Fleming of a course of Cantor Lectures on "Electric Oscillations and Electric Waves." Owing, however, to the lecturer having been unexpectedly summoned to America, Professor Vivian B. Lewes will give three lectures on "The Incandescent Gas-Mantle and its Use," on the 7th, 14th, and 21st prox.

**The Waste of Energy by Artificial Lights.**—"Nature" points out that all artificial lights, even the best, are extravagantly wasteful of energy, inasmuch as they lavish it in the infra-red, and not in the visible spectrum. Mr. C. G. Abbot, who has charge of the Astrophysical Observatory of the Smithsonian Institution, has examined the light emitted by the Welsbach and other incandescent mantles by means of the bolometer, with a view to comparing their efficiencies. Though the illuminating powers differ considerably, the distribution of energy is much less diversified than would be supposed, and shows clearly the wastefulness even of the Welsbach light as a source of illumination. The infra-red in each case includes by far the greater portion of the energy, and not the visible spectrum, as is the case with the sun, and still more with phosphorescent substances. Excluding infra-red radiation, the Welsbach mantle was found to be superior in light to the others experimented with, especially in the red, orange, and yellow parts of the visible spectrum.

## A POPULAR ACCOUNT OF CARBURETTED WATER GAS.

EVERYONE who has watched the progress of literature during the past few years cannot fail to have been struck with the large number of new illustrated magazines which have made their appearance and appealed for the support of the public. One of the most recent arrivals is "Feilden's Magazine," which is claimed by the proprietors to be "the world's record of industrial progress." We need not stop to consider how far this claim has been justified by the nine numbers which have already been issued, but will simply call attention to one feature of the publication—viz., a series of articles on particular departments of industry, written by gentlemen specially qualified to deal with these subjects. In the first numbers we found Professor Vivian B. Lewes discoursing on "Acetylene Generators;" then followed some articles on "Modern Appliances in Gas Manufacture," commenced by the late Mr. G. Ernest Stevenson, and continued by his brother, Mr. Fletcher W. Stevenson; and in the current issue there is an article on "Carburetted Water Gas," by Mr. S. Cutler, jun. The author, as most of our readers are aware, is a member of the firm of Messrs. S. Cutler and Sons; and he has given special attention to the development of the new system of gas manufacture, which he has personally studied in many of the principal gas-works in the United States and Canada.

Mr. Cutler at the outset of his article shows the great progress which has been made with water gas in this country in the past decade. Ten years ago, no gas of this kind was produced in England; whereas now it is manufactured in upwards of sixty important gas-works in the United Kingdom, and the number of installations is rapidly increasing. The plants already either at work or under construction are capable of producing upwards of 100 million cubic feet of gas per diem—a quantity equal to two-thirds of London's maximum daily consumption, and four times as much as is required to supply Manchester. Though carburetted water gas has now been established on a firm footing, it has had a long and chequered history. Its potentialities were early recognized by English gas engineers; but the impossibility of securing a suitable carburetting material long delayed its successful utilization. It was the discovery of petroleum which aroused new interest in carburetted water gas. Mr. Cutler describes, by the aid of illustrations, the method of producing this gas, and points out, for the benefit of those who have not had experience with the plant, that it is most essential that dry high-pressure steam and a hot generator should always be maintained, as with too low a temperature in the generators the carbon consumed is not wholly converted into carbon monoxide, but forms some carbonic acid, until a point is reached at which the latter is formed to the entire exclusion of the former. The temperature necessary in the carburetter and superheater for volatilizing and fixing the oil is much less than that required in the generator; and variations are at times desirable to suit particular descriptions of oil. Too great heat produces lamp-black; too low a heat, an undue proportion of tar. The object of the operator should be to avoid both extremes. Mr. Cutler mentions the absence of residuals as a striking feature of the carburetted water-gas process. He gives analyses by Mr. W. J. A. Butterfield, F.I.C., F.C.S., of gas and tar produced by plants made by his firm, and remarks that the proportion of sulphur impurities present in the crude gas will vary according to the description of coke and oil used in its manufacture; but he emphasizes the fact that, as the percentage is invariably far below the quantity present in coal gas, purification is more simply and cheaply effected.

Of course, from a gas manager's standpoint, carburetted water-gas plant is, as Mr. Cutler remarks, a most useful auxiliary to a coal-gas plant. With its assistance, low-priced coals can be used; the price and stock of coke can be controlled; and labour difficulties are decreased—fewer men being required, and those employed quickly learning the mode of operation. Facility of production reduces the necessity for having the large amount of storage accommodation required in districts subject to sudden demands for gas. Furthermore, there are but few points in carburetted water-gas manufacture which can cause nuisance or difficulty; but some of those which are incidental thereto are indicated by Mr. Cutler. For instance, during the "blow," fine coke dust is frequently carried through the vessels with the air-blast, and is liable to deposit upon surrounding property, and may cause nuisance. This dust can, however, as he shows, be intercepted by a suitable appliance. Another matter which has engaged a good deal of attention is the separation of the water from the residual tar; but this is effected without difficulty by the use of a proper apparatus.

The last point dealt with by Mr. Cutler is the probable effect upon the public health of the extended use of carburetted water gas. He refers to the long investigation made by the Departmental Committee appointed by the Home Office to consider the subject, and to their limitation of the percentage of water gas allowed to be supplied for illuminating purposes. He shows that, for several reasons, the American system of sending out undiluted water gas is not likely to be followed in England; the interests of the gas companies being best served by the use of a moderate proportion only in conjunction with coal gas. This part of the article is illustrated by two striking reproductions of photographs showing the difference between the old and the new method of gas making.

## PARLIAMENT AND THE COAL QUESTION.

LAST week (p. 881) we reprinted a letter which Mr. A. D. Provand, M.P. for the Blackfriars Division of Glasgow, has addressed to the First Lord of the Treasury on the subject of the coal resources of the country. In reply to a question previously put by Mr. Provand in the House of Commons, Mr. Balfour had stated that, unless there was some practical issue to place before a Royal Commission on Coal Resources, he saw little use in appointing one. That appeared to us, at the time, to be the inevitable reply to the question as put. In reviewing recently*, in the light of subsequent events, the findings of the Commission that reported in 1871, we defined the only practical question that seemed to call for the appointment—not of a Royal Commission, but of a less ponderous machine of inquiry, a Committee of Experts, who could be appointed under the auspices of the Home Office. The extent of our coal resources was made the subject of exhaustive investigation by the 1866 Commission; and their report needs little revision in that respect. The contents of the coal seams since discovered could be easily ascertained from the Inspectors of Mines, and added to the estimates of the Commissioners. The probable duration of these resources was calculated in the report on each of two hypotheses; and, as we showed in the articles referred to, one of those bases of calculation—judged by the past thirty years' statistics—is very little wide of the mark.

Mr. Provand, in his letter, only deals with the calculations supplied by Mr. Price Williams to the Commissioners which were based upon the other, and much more inaccurate, hypothesis. He says: "Two years hence—that is to say, in 1901—the year for which the Royal Commission made their estimate, the production of coal will probably be several millions more than last year. Taking this at only 4 millions, the difference between their estimate and the actual output in 1901 will be as 174 millions is to 224 millions, making a difference of 50 million tons in excess of what the Royal Commission estimated." No mention whatever is made of the fact that, upon the alternative basis used by the Commissioners—which put the production for the 30 years just ended at 4605 millions, whereas the actual was 4788 millions, or barely 4 per cent. more—the estimated quantity to be raised in 1901 would be 203, not 174 millions. The question of the probable duration of the supply of coal lying at depths not exceeding 4000 feet, is, we submit, one that can be decided, for all practical purposes, by the aid of the 1871 report, the subsequent mining statistics, a set of logarithm tables, and a careful study of the history of the coal trade and the cognate industries.

What does call for inquiry is, as we have said before, "the fact that we have, at present, no official estimate of how much of the coal lying in the strata of moderate depths exists in easily (and therefore cheaply) worked seams, and how much in seams so situate or so thin that the cost of 'winning' the coal will be considerably higher than the present cost of production. Upon this point more information is desirable, and should not be difficult to obtain. The present is a time when the authorities might well be approached with a view to the appointment of a Committee of Experts to determine and report the actual facts of the case. Those facts must have an important bearing upon the possibility of this country maintaining its ground in the commercial competition with other countries—in particular with the United States."

The importance of this question is fortunately recognized and set out by Mr. Provand in his letter; and it is a pity that he somewhat weakened his case by suggesting, what is not the case, that the Royal Commission estimate was hopelessly inaccurate. The fact that the figures he quotes were those supplied to the Commission by Mr. Price Williams, and not, as he says, those calculated by the Commissioners themselves, is just the sort of mistake upon which the official mind—anxious to avoid trouble—fastens in replying to a demand for inquiry such as is now made. Other points to which attention is rightly drawn are the importance of a supply of coal for our Navy, and the rapidly growing production—from practically unlimited resources—of coal in America, which combined we may add with the fact that, owing to the use of coal-cutting machinery, coal is raised more cheaply in the States than in our own country, must enter increasingly into the question of the coal trade and the general commercial position of Great Britain.

Another aspect of the coal question, to which public attention is being drawn, and which it has been—and is being—sought to bring before Parliament, is that which is presented by the growth of the exports of coal, and the desirability or otherwise of prohibiting such exports or of imposing a duty thereon. This is a very interesting question, and one upon which very divergent opinions are being emphatically expressed in the daily Press. The case for putting a duty upon coal exports has been taken up by Mr. George Harwood, the Member for Bolton, who sought to move an amendment to the Budget substituting such a duty for the increased tax of 2d. per pound on tea. This motion was, as might have been expected, ruled out of order, as being a proposal by a Member, other than a Minister, to impose a new tax. It is stated that Mr. Harwood intends, if he find an opportunity, to move a resolution on the subject; and, should he be able so to do, a very interesting debate ought to ensue.

* *Ante*, p. 528.

The question of imposing a duty on coal, with the idea of obtaining therefrom a considerable revenue, is quite distinct from, though frequently—and by Mr. Harwood himself—confounded with, that of taxing exports in order to reduce or prohibit them. For it is obvious that the latter purposes cannot be attained except at the expense of foregoing the revenue which would accrue from a tax not heavy enough to be prohibitive. The tax cannot be "patriotic" and productive at one and the same time. The case urged by the prohibitionists is based upon the necessity of a supply of cheap, home-produced coal to the maintenance of our commercial superiority; the vital importance of coal to the Navy; and the unwisdom of supplying the navies of potential enemies with the coal they need. On the other hand, it is pointed out by a writer in the current number of the "Nineteenth Century" that, although the possession of coal is vital to our home manufactures, yet it is further true "that the rate of increase of our coal exports is the measure of our commercial prosperity. Besides affording a medium of exchange in dealing with other countries, coal is practically the only heavy article of cargo that can serve as ballast for vessels freighted with lighter merchandise; and if outward-bound vessels could not obtain sufficient cargo, there would be a serious increase in the cost of imported foodstuffs and iron-ore." In fact, all the details of our complicated system of commerce are so bound up together and inter-related, that to remove therefrom a trade of the annual value of over twenty millions sterling, would entail the most wide-reaching and, at first consideration, unforeseen consequences.

It is further asked: If it be wise and necessary to prohibit by State regulation the export of coal in order to provide for the distant future, why should not the home consumption be so regulated? That is to say, if it be improvident to realize our capital as represented by coal, is it not also improvident to deplete our supplies of iron by exporting both the crude pig iron and the finished hardware or machinery? For it must not be forgotten (as some appear to quite forget) that we are not disposing of our national capital—in the shape of coal and iron—and receiving nothing in exchange. The rapid growth of prosperity in this country in the past half century is due in no small measure to the turning of those minerals into exchangeable forms of wealth; and it is scarcely exaggeration to say that, in return for thus giving the world coal and iron, we are becoming, financially, the owners of the world. The amount of British capital invested in foreign countries is enormous, and is steadily increasing. It will, in truth, be difficult, nay impossible, to persuade the British nation that they must materially reduce the rate at which they are, by selling their coal and iron to other countries, accumulating wealth, in order, by so doing, to benefit posterity a century or so hence. As Professor Jevons truly said: "If we lavishly and boldly push forward in the creation and distribution of our riches, it is hard to overestimate the pitch of beneficent influence to which we may attain in the present. But the maintenance of such a position is physically impossible. We have to make the momentous choice between brief greatness and longer continued mediocrity." The British nation has chosen the "brief greatness," which, however, will be of sufficiently enduring briefness to outlive the present, and immediately following, generations. We shall not live to see how the accumulated wealth possessed by these islands when their coal-fields have been commercially exhausted, will either be distributed, or will in some manner unforeseeable now, maintain the supremacy of Britain.

So far as the imposition of a tax upon exported coal for purely revenue purposes is concerned, the question is really one of political and economic expediency. Whether, as has been suggested, Germany, France, and Russia would resent it as an unfriendly act, we think is very doubtful. They, at any rate, are not remarkable for considering their neighbours' interests before their own, so far as either import or export duties are concerned. We are, however, strongly of opinion that the problematical advantage to be gained by the substitution of an export duty on coal for an import duty on tea, is not sufficient to warrant such a change in our fiscal system. But should it at some future time be determined upon—which is by no means probable—coal consumers, as such, in this country would, if affected at all, not be adversely affected. If the duty restricted the export, the tendency would be to a fall in prices at home. On this ground, gas managers would at present be disposed to fervently pray for a total prohibition of foreign shipments.

**Combined Increase in Prices in the Meter Trade.**—It was rumoured last week that the meter makers have decided to increase their prices by 5 per cent., excepting upon prepayment meters, the rise to take effect as from yesterday. There was, we believe, some talk of going to the extent of 7½ per cent.

**Waverley Association of Gas Managers.**—The 78th half-yearly meeting of this Association will be held in the Station Hotel, Selkirk, next Thursday, under the presidency of Mr. W. B. M'Lusky. According to the programme issued by the Hon. Secretary (Mr. Alex. C. Young, of Kelso), the business will consist of a short address by the President, to be followed by an informal discussion, and the appointment of office-bearers for the ensuing year. At the close of the business dinner will be served; and in the afternoon there will be a drive.

## PERSONAL.

Mr. J. Gibb, of Lanark, succeeds Mr. Duncan Jeffrey (who has resigned) as Manager of the Kirkintilloch Gas-Works.

Mr. J. Donaldson has resigned the Managership of the Sandwich Gas-Works on his appointment to a similar position at Sittingbourne.

The position vacated by Mr. W. Spier as Secretary and General Manager of the Rockhampton (Queensland) Gas Company will be filled by Mr. Arthur Lloyd, one of the Company's staff.

Mr. Frank Tomlinson, formerly Assistant-Manager of the Rochdale Water-Works, and for six years in the service of the Conservators of the Thames, has been appointed Managing Water Engineer to the Northampton Corporation.

Mr. W. Gorse, who was appointed, towards the close of last year, Engineer and Manager of the Walsall Corporation Gas-Works, in succession to Mr. John Tindall, who was about to retire, has sent in his resignation, which has been accepted.

At the meeting of the Institution of Civil Engineers last Tuesday, it was announced that Mr. J. W. Helps, of Croydon, had been transferred from the class of associate members to that of members; and the monthly ballot resulted in the election of Mr. Neil J. Peters, of the Water-Works Department, Southampton, to the former class.

At the meeting of the Oldham Corporation last Wednesday, the minutes presented by the Gas Committee notified the appointment of Mr. Edwin Platt to the position of Assistant-Manager, as mentioned in the "Journal" last week. The Chairman (Mr. Letham), in moving the adoption of the minutes, spoke highly of the 42 years' service of Mr. John Chadwick, the Manager, who, he said, had expressed the opinion that Mr. Platt would make a most capable successor.

On the occasion of the silver wedding of the Engineer of the Southwark and Vauxhall Water Company, Mr. and Mrs. J. W. Restler were presented with a handsome silver tea and coffee service and tray of George III. pattern, by the officers, staff, and employees of the Company—the subscribers numbering over 200. The presentation was made by the Secretary, Mr. Montague Watts, last Friday week (the anniversary of the wedding being the following day), in an appropriate speech, and in the presence of representatives of all departments of the Company's service. Mr. Restler acknowledged the gift in a few well-chosen words.

Some important changes in the management of the Merthyr Tydfil Gas Company have just been decided upon. At the meeting of the Directors last Wednesday, the Engineer and Secretary, Mr. John Lees Cocker, tendered his resignation of these appointments, owing to failing health, after the long service of 43 years in the dual capacity. The Directors desired him to reconsider the matter; but he felt he was unequal to bearing the responsibilities of the position, and his resignation, which will take effect on the 1st of July, was reluctantly accepted. In a minute entered in the books, the Directors expressed their great regret at the step taken by Mr. Cocker, and placed on record their sense of the valuable services he had rendered to the Company during his long connection with it. The growth of the undertaking is shown by the fact that when he took charge of it in 1856 the mains were only 2 miles long, whereas they now extend 32 miles; and the works have been proportionately enlarged and improved to meet the increased demand for gas. Consequent upon Mr. Cocker's resignation, there has been a re-distribution of offices. In order that the Company may still have the benefit of his invaluable knowledge of the works and district, he will be retained in the capacity of Consulting Engineer, while Mr. J. E. Kenshole, who is at present Deputy-Manager, will become Manager, and the Accountant, Mr. G. Williams, will receive the additional appointment of Secretary. Thus the duties relinquished by the General Manager are divided between present members of the staff, who will still have the benefit—it is to be hoped for many years—of the ripe experience of their respected chief.

## OBITUARY.

We learn with regret of the death, in his 86th year, of Herr H. B. Geinitz, of Dresden—an eminent geologist, who collaborated with Herren Fleck and Hartig in the production of an exhaustive work on "The Coals of Germany and other European Countries." Though published in 1865, this work is still the recognized authority on the subject. We regret also to record the death on Feb. 25 of Herr E. Blumer, Manager of the Municipal Gas-Works at Thun, in Switzerland.

We regret to record the sudden death, early last Wednesday morning, at his residence, West Hill Place, Highgate, in his 87th year, of Mr. W. P. Bodkin, J.P., the Chairman of the Hornsey Gas Company. Deceased had been enjoying very good health; but he was unable to stand against the effects of the last of several operations he had had to undergo. Mr. Bodkin was a member of a family long connected with the practice or administration of the law. His father (Sir W. H. Bodkin) was for many years Chairman of the old Middlesex Sessions, and Sir Harry Poland is his near relation. He became a Magistrate in 1854, and held for many years his father's office;

but when other arrangements were made for the Middlesex Sessions, he transferred his energies to the Highgate Bench, of which he became Chairman in 1893. He resigned this position, owing to defective hearing, in 1898, though he sat on the Bench as recently as the 19th ult. In addition to his connection with the Hornsey Gas Company, he was on the Boards of the Colney Hatch Gas Company and the Chelsea and West Middlesex Water Companies. He was also a Deputy-Lieutenant for Middlesex. Deceased leaves a widow; and one of his sons is Mr. A. H. Bodkin, the Treasury Counsel.

## NOTES.

### Cross-Breaking Tests of Concrete.

Referring to a remark in the "Engineering Record" on the dearth of records of cross-breaking tests of cement concrete, Mr. Robert Moore, of St. Louis, gives details of some tests of the kind carried out by himself during 1890 for the Viaduct of the Merchants' Bridge Terminal Railway. These are described as having been carefully made, and possessing considerable value. The concrete used in all the foundations was made of portland cement, river sand, and broken limestone, in the proportions respectively of 1, 3, and 6 parts. With these proportions, it was found that a barrel of cement made 0·96 yard of concrete. To ascertain the strength of this concrete, a number of beams, 30 inches long and 9 inches square, were made from batches actually used in the work. These blocks were buried in the ground for periods of 8, 9, 10, and 11 months. At the end of the time, they were broken transversely, by means of a lever apparatus so arranged as to give a gradually increasing known load. The results went to show an unexpected uniformity of tensile strength, the average breaking load being 354 lbs. per square inch, with a minimum of 307 lbs. and a maximum of 412 lbs. The average strength of the neat cement tested in the usual way by seven-day briquettes was 437 lbs. per square inch. It varied, however, from 307 lbs. to 567 lbs., which means that while the variation of strength of the neat cement ranged as much as 85 per cent., the variation in the concrete was only 34 per cent.

### Tenement House Building in New York.

In connection with the present discussion of the housing problem of the poorer districts of towns, it is stated in the "Engineering Record," of March 3, that Mr. R. Thomas Short, of New York, has won the first prize in a competition for tenement-house planning instituted by the Charity Organization Society of that city. The journal gives a sketch plan of Mr. Short's solution of the problem, which is to be acted upon by a New York Company. The chief conditions of the competition were that the tenements should embody improvements upon those in existence, preserve economy of construction, convenience of arrangement, good light and ventilation, and cheerful outlook. They were to be at least as commodious, for the ground occupied, as those in actual habitation. It would be out of place to reproduce the premium plan here; but as illustrating a recent editorial argument of ours, it may be noted that the unit of treatment is the ordinary "city lot," which is 100 feet square. This unit is easily multiplied so as to fill a whole "city block" of 200 feet by 400 feet. The proposed building is six stories high; and the tenements are of two, three, and four rooms. It is interesting to note that all the tenements have their own gas cooking-range; while steam heat and hot water are to be laid on. It is claimed that the designer has succeeded in exceeding the average rentable floor-space of this class of building by about 5 per cent., while providing room for perambulators or bicycles. Much space has been saved and simplicity of planning secured by dispensing with chimneys.

### The Sampling and Analysis of Coals.

An important report on coal analysis has been presented to the American Chemical Society by a Committee appointed to investigate the subject. The object of the inquiry was to ascertain how far uniformity and reliability in this matter of coal analysis could be promoted by systematizing the sampling and other details of the procedure; it being well understood by coal users that the usual advertised analyses are not invariably corroborated in practice. The Committee go into the question very thoroughly. They recommend the taking of samples by shovelfuls thrown aside at regular intervals during the loading or unloading of the truck. The sample should be of considerable amount; and after being turned over and broken, if necessary, it is to be reduced to the final sample by the process of quartering on a hard, dry floor. This must be done quickly, and the result put into a sealed jar. Directions are given for the determination of the moisture. The volatile matter is to be determined by heating one gramme of the fresh, undried, powdered coal in a covered platinum crucible for seven minutes in a strong bunsen flame. From the result thus ascertained, the proportion of moisture otherwise found has to be deducted. It is admitted that this determination of volatile combustible matter is an arbitrary one, and does not show what compounds existed in the coal before heating. The Committee think, however, that their simple prescription agrees fairly well with commercial coking results. Directions for testing for ash, sulphur, and fixed carbon are given. The report has been reprinted from the "Journal of the American Chemical Society,' and forms a useful pamphlet for a works laboratory.

### Motor Waggons, Gas-Mains, and Soft Roads.

The judgment of the Irish Master of the Rolls in the Dublin Gas Company's steam-roller case, giving protection to gas and water mains in roads from damage by steam rollers and other extraordinary traffic, lends particular importance to the movement actually in progress for amending the Light Locomotives Act, 1896, in the sense of increasing the tare maximum of motor vehicles. This Act exempts from the restrictions imposed by previous Acts all road motors under 3 tons in weight. It has been declared repeatedly by Mr. Thorneycroft and other experts that it is impossible to build steam waggons to carry useful loads of from 3 to 5 tons with this tare limit. The question arises therefore as to how the limit can be removed without rendering the motor vehicles dangerous to gas and water mains; and the suggestion is made that this is a matter of width of tyre. For the sake of the tractive efficiency of the vehicle itself, the rule is laid down that the wheels should never be so narrow as to make a rut, which increases the tractive resistance enormously. Here, again, the effect of hardness of road surface becomes of great importance. All experience of the work goes to show that the familiar traction engine is more like what the steam road-waggon of the future will be than the flimsy creations that began to be seen on the roads when the Act of 1896 first came into force. Unexpectedly great tractive power is required for self-propelled road vehicles; and it is hoped that for their part highway authorities will make their roads harder, and not use so much soft filling stuff as they have got into the habit of putting on a so-called macadam surface.

### The Fireproofing of Wood.

Mr. Sherard Cowper-Coles expounded to the London Section of the Society of Chemical Industry, the different processes by which wood is rendered uninflammable. It was stated that, by modern methods of treatment, wood can be made to withstand ignition at the temperature of the bunsen flame (1820° C.). There is still some difficulty in effecting this object without injuring either the strength or appearance of different woods, and at a reasonable cost. Apparently, one of the best processes is that of Simpson, now being worked by an English Company at Fulham, which consists in impregnating the timber with a solution largely composed of phosphate of ammonium. The soluble matter of the wood is previously extracted with methylated spirit; and the subsequent treatment takes about four hours. Wood so treated is not so good a conductor of heat as untreated wood. On the other hand, fireproofing by ammonia compounds makes the timber corrosive of metals; and the filling does not stand the weather. Mr. Cowper-Coles has tried the effect of modifying the treatment by the addition of other salts, without much positive advantage. It was admitted that the process is still susceptible of improvement, mainly in respect of the correction of the undesirable consequences of using ammonia salts. It appeared to be conceded that, while wood itself cannot be made other than inflammable, its pores can be filled with something that will prevent it from bursting into flame. Salts of ammonium, including the sulphate, do this by producing nitrogenous charcoal which only burns with great difficulty. Unfortunately, these preparations will not stand water.

### The Progress of Electro-Chemistry.

In a recent number of "Nature," a summary was given of the modern development of the science of electro-chemistry and its application to manufacturing industries. Text books of chemistry only ten years old scarcely refer to the use of electricity in metallurgy, and still less to its adoption as a means of producing metallic salts or the non-metals. During the last thirty years, the processes of electro-deposition of metals made little progress before the advent of the dynamo and the storage battery. The industrial production of absolutely pure copper is an electrical process, which also lends itself to the manufacture of weldless copper tubes. Zinc galvanizing by electrolysis is at present practised to a very considerable extent; one advantage of this method being that the inside of tubes and fittings can be properly protected. It is scarcely necessary to discuss the manufacture of calcium carbide; but it is noted that the expansion of this trade is hampered by the restrictions which it has been deemed necessary to place on the storage of the carbide. One of the most interesting of the latest applications of electrolysis is in the production of large accurately-reflecting mirrors. Such mirrors, made of metal, have hitherto been only successfully made for small reflecting lamps. Large reflectors, for powerful lights, have always been made of glass; and the risk and loss by breakage were necessarily considerable. Now, by the new process which is credited to Mr. Cowper-Coles, large reflectors can be made of metal, the reflecting surface being palladium, which does not tarnish in the atmosphere. Many artificial light effects may be modified in consequence of this invention.

**The Supply of Artificial Illuminants in France.**—The sale of gas in France last year is estimated to have produced about £20,500,000; of petroleum, £4,500,000; and of electricity, £2,000,000.

# TECHNICAL RECORD.

## INFORMAL MEETING OF SCOTTISH GAS MANAGERS.

The Seventeenth Annual Informal Meeting of Scottish Gas Managers was held in the North British Station Hotel, Glasgow, last Wednesday. Mr. J. W. CARMICHAEL, the Manager of the Barrhead Gas Company, presided; and there was a larger attendance than there had been for some years.

The proceedings having been formally opened,

Mr. CARMICHAEL delivered the following

### CHAIRMAN'S ADDRESS.

My first duty on this occasion is to thank you for the honour you conferred on me last April, when you elected me Chairman of this meeting. I felt a considerable amount of diffidence in accepting the post. But I know you will forgive any shortcomings on my part; and I hope this meeting will be as interesting and instructive as any of its predecessors.

I think it will be admitted by all that the past year has been exceptionally trying to most gas managers. This has arisen from several causes—first, the ever-increasing demand for gas; secondly, the difficulty in procuring the required weekly quantities of coal, said to be on account of the railway companies' inability to provide waggons (this may be partially the explanation, but I am afraid more fault is to be found with colliery owners, who give the greatest attention to those who pay the biggest price); and, thirdly, the fact that the closing weeks of last year were very dark. This last-named factor was experienced especially in the West, where for successive days darkness reigned supreme. One manufacturer in Barrhead informed me that for two days the gas was kept burning in all the flats of his mill from 6 a.m. to 6 p.m.—a thing that had never occurred before. Of course, some will say that this was a good thing for the Barrhead Gas Company. I answer, "Yes" and "No;" for one is hardly prepared, at a moment's notice, to supply gas night and day, more especially when one is hampered by want of storage. This was my difficulty. Our present gasholder capacity only amounts to 120,000 cubic feet, as against a maximum make of nearly 190,000 cubic feet. I am glad to say this state of matters will soon be remedied as far as we are concerned, as the Contractors have nearly finished the erection of a telescopic gasholder, which will give us additional storage amounting to 240,000 cubic feet, making 360,000 cubic feet in all, or two days' supply—a very comfortable position for a gas manager to be in, as far as storage is concerned.

Another thing which has tried gas managers during the past year has been the increased price paid for gas coal; the advance being at the rate of 25 to 28 per cent. Some of us raised the price of gas. I think, however, I am right in saying that the majority of corporations and gas companies are selling their gas at the same rate as in the previous year. And why? Because they thought the price of coal would fall before long; and they were willing to face a year of diminished profits rather than raise the price to the consumer. I regret that their expectations are not likely to be realized, as the selling price of coal at present is 25 per cent. over last year's quotations. The consequences, I expect, will be that all round there will be a sharp advance in the price of gas. In view of the great economy already prevailing in all gas-works, it will be impossible to make both ends meet without having recourse to such means, if the present inflated prices for coal are maintained. However much or little the price may be increased, vigilance will have to be exercised by every manager, so that nothing may go to waste. I know that of late years the demand has been for cheap gas. To meet this demand, economy has been the order of the day; and it would be very difficult to suggest anything whereby further economy could be secured.

Allow me just to say that there is no excuse for a manager working retorts on the old system of settings. Let him have the new, which can be built in as cheaply as the old, and he will find an improved make per ton and a large saving in fuel. Further, there are very many little things about a gas-works which, if attended to, materially help the finances. There are three points of very great importance which any gas manager should strive for, if a gas undertaking is to be a financial success—viz., plenty of retort power, coal storage, and gas storage. It is useless for me to enlarge on these. You all know the difficulties to be overcome, and the anxiety caused to every gas manager not adequately equipped in these respects. Of all the difficulties a gas manager has to contend with, the want of adequate storage must rank as the first. In looking over the statistical report for last year, I find that there are nearly 100 gas-works whose storage is under the maximum make. This is far from being a satisfactory state of matters; and it is, without doubt, one of the greatest obstacles to successful management. It means great loss in many ways; but the greatest loss of all is the diminished sale of gas caused by the reduction of pressure. This is not what ought to be. If gas companies are to please the public, a sufficient supply of gas at all hours must be provided.

In Scotland, the quantity of gas manufactured amounts to 12,637,620,000 cubic feet. Of this quantity something like 1,200,000,000 cubic feet, or about 9½ per cent., is unaccounted for. Of course, we all know that this is not all loss through defective mains and services. Lamps have a great deal to do with the apparent loss of gas. Commissioners are a body of people you can never satisfy, especially if it is a private company that is supplying the gas. I remember a gentleman remarking at one of our meetings that he, for one, would be glad if the Commissioners would light all the streets by electricity, as it would be a saving to the Gas Company. I sympathize a great deal with that opinion. Commissioners may say what they please about the charge for gas, but companies do not benefit a great deal from gas consumed in this way. I have heard it said that the more meters you have fixed, the better the average per lamp. The idea of fixing a meter on every lamp, or laying a separate main for the lamps, the gas to pass through a meter at the works, must be dismissed as too expensive I believe a better way than the average meter system is to calculate the number of hours the lights burn; and if care is taken to have each lamp fitted with a governor to pass no more than the requisite quantity of gas per hour (of course, after the pressure has been ascertained), a very near statement of the quantity of gas consumed should be got. Station meters may have a great deal to do with leakage if the temperature of the gas is high when measured. Defective mains and services assuredly account for the greatest proportion of the loss. Systematic examination of the mains and services ought to be made, so that the whole distributing plant could be overhauled once in five years; and consumers' meters should all be tested now and again. If these matters were attended to, a very great saving would result.

I think the present a very opportune time to put before you the question of reducing the illuminating power of the gas to (say) a uniform standard of 20 candles. I must say, speaking for myself, I favour the reduction; believing, as I do, that gas of this standard will give quite as good results for all purposes as that of higher quality. If this standard were to become general in Scotland, the price of gas could be substantially reduced. At one time it was necessary to maintain the illuminating power of the gas at a high standard, in face of a strong competitor like the electric light; but this state of things has been changed somewhat by the introduction of the Welsbach burner, and latterly by the intensified gas-light. In Scotland, the increase of gas manufactured over the previous year amounted to 8·20 per cent. A very large proportion of this increase has been caused by the use of gas for other than illuminating purposes. I dare say more of it would be employed in this way were it cheaper; and this result could be attained if the illuminating power were reduced to 20 candles. Some one might be inclined to question the expediency of lowering the quality for a class of consumers whose united consumption of gas is very small as compared with that used for illuminating purposes. That is so; and I would not recommend the reduction but for the fact that the introduction of the Welsbach burner has been one of the greatest advances in regard to lighting. The incandescent burner is being adopted very extensively by ordinary consumers; and its use would become general were it not that the price is prohibitive. I believe, however, that in a few years, as the patents expire, the market will become flooded with mantles, good, bad, and indifferent, at a price within the reach of the poorest. What I say, therefore, is that gas of 20-candle power will be found as serviceable for lighting and for other than illuminating purposes as 24-candle gas. With the present price of splint and third-class cannels, very little advantage would accrue from making the change now—something like 1½d. per 1000 cubic feet; but if coals should fall to (say) 10s. 6d. per ton for splint and a small mixture of third-class cannel, then I say the time would be ripe for advocating the change. With the above mixture of splint and cannel, gas of 20 candles could be got at a cost of 1s. 0·60d. per 1000 cubic feet. If, however, the gas is kept up to 24 candles, then a mixture of splint, &c., with first-class cannel would require to be made, at a cost per 1000 cubic feet of 1s. 5d.—a difference of 4·40d., or fully 1d. for every candle over 20. By lowering the illuminating power of the gas, a very substantial reduction in price could be made, which, I am sure, would be appreciated by most people, and would extend our business as gas suppliers. Another remark I would make is that, if we are to still farther widen the difference between the cost of electricity and gas, it will only be by a change of this kind.

In large squares or workshops, the intensified gas-light can be used with advantage; and when placed beside the electric light the latter is not in it. I expect soon to see a small installation fitted up in one of our large works in Barrhead; and I have every confidence its adoption in this particular class of works will become general. In Barrhead, we have the electric light in use in two of the works—one an engineering shop, where it is used for general lighting, while it was introduced into the other because a naked light could not be used owing to explosive gases accumulating from certain chemicals. In both cases the gas account shows very little difference. It is needless, however, to shut one's eyes to the fact that electric lighting is steadily on the increase. Not many years ago, the opinion of most gas managers was that paraffin oil was our greatest opponent. We have not that opinion now. And why? Because prepayment meters have come in as the opponent of oil, and a very successful opponent too. The progress of the electric light last year was steady. From a statement which I have somewhere read, there are 2,700,000 incandescent lamps now in use in London alone, and

4,100,000 in the Provinces; making a grand total of nearly 7,000,000. Ten years ago, there was very little public supply of electric lighting in the Provinces; now there are 152 towns in Great Britain in which such supply is given, and 42 other stations are in preparation. In 1899, there were 89 grants for Provisional Orders for electric lighting supply—70 for municipal corporations, and 19 for companies.

Electricity is being used for many purposes, especially for motive power. In Barrhead, it is used in connection with a large foundry crane. Many of you would observe that the Bradford Corporation have commenced the hiring-out of electric motors from ½ to 10 brake horse-power. The rental per annum is the very moderate one of 30s. to £8, according to size. This is a new departure, and should, I think, bring many gas managers to consider the question of hiring-out gas-engines as well as stoves. Again, it is admitted that the electric light is becoming cheaper; but when compared with gas, it is still a long way behind as far as cheapness is concerned. I am not one of those who speak lightly of the electric light—a mistake some gas managers are apt to fall into. We console ourselves with the thought that if we have lost the gas supply of a mill, consuming (say) a million cubic feet per annum, through the introduction of electricity, we have an increase from other sources amounting to 3 million cubic feet, and we are very apt to ask what harm has been done. Very great harm, to my mind; for whereas you have had 3 million cubic feet of increase, you would, in all probability, have had 4 million cubic feet had the electric light not been in your town. Moreover, we never know the moment when some new discovery might be made whereby the cost may be materially reduced. Gas managers, however, have no cause to fear. There will always be a large demand for gas; and, meantime, we can hold our own as far as light and price are concerned. Still, the great advance in the cost of coal is an opportunity for the electrician, of which he will not be slow to take advantage.

In passing, we might ask ourselves what is the cause of the great rise in the price of coal? We thought last year's figures were too high, or at least sufficiently high to give miners a fair day's pay and at the same time a large return to the colliery owners; and yet we find the prices quoted since October last have gone up and up until they now stand at a figure which is unjust to the people of this country. Miners' wages, which get the blame of many of the rises in the past, have not advanced for some months now. The secret, I suppose, is good trade. Our Government of late years have been making large additions to the fleet of war vessels. This and other things have caused the iron and steel industries to be exceptionally busy; and as they consume large quantities of coal, the supply for the gas and other industries has been severely taxed. But I do not think that the good trade we are experiencing all over the country, or even the largely increased quantity required for gas-making purposes, accounts wholly for the enormous increase in the price of coal. I am inclined to think restricted output has a good deal to do with it. The miners, as you know, are averse to seeing stocks at the pit heads, more especially when wages are good; and so, the demand and output being about equal, the owners are using their opportunity to advantage.

The system of regenerative firing has become general, not only in large, but in small works. I believe that no part of the apparatus of a gas-works has received more attention than that given to heating retorts; and as a result, different systems have been adopted with equally good results. By the substitution of gaseous firing, and taking advantage of the waste gases for heating the secondary air, very decided advantages have been obtained as compared with direct firing; the amount of fuel used being something less than half, in addition to a considerable increase of gas per ton of coal, while the heating of the retorts being regular, the wear and tear is reduced. The great saving in fuel, and the increased quantity of gas per ton, have helped very materially to reduce the price of gas.

It has been often said, and we know it to be a truism, that with all our care and attention in the retort-house, any advantage gained may be partly lost by lack of care as to the requisite temperature of the gas as it issues from the condensers. I am afraid, however, that, although every gas manager knows that the gas should issue from the condensers at from 60° to 65° Fahr., with the atmosphere ever changing and various quantities of gas passing from hour to hour, it is almost impossible for managers of small and medium-sized gas-works to regulate the temperature of the gas. Of course, some use sprinklers, and others have valves so arranged that part of the condensers can be bye-passed in cold weather; but you seldom come across the one or the other in small works. I am sure many will be pleased to have the opinion of gentlemen present on this matter; and if any simple method could be suggested it would certainly be of help to many a one, for there is no doubt that in winter we require a larger percentage of first-class cannel than we do in summer, which is clearly traceable to the temperature of the gas being low.

Considerable economy has resulted from the admixture of a little air with the crude gas. Several gas managers in Scotland have tried it, and are still continuing it, with gratifying results. Differences of opinion exist as to whether the gas should flow downwards or upwards through the lime. I do not think it matters very much which way it goes, providing you have purifiers of ample size. In my works, the gas goes in at the bottom and comes up through the lime; and I find the top layer of lim is hardest (the other two being quite easily broken up), and have no extra back-pressure. Distribution of gas requires care and attention on the part of a gas manager, more especially at the present day, when the demand for gas for heating, cooking, and other purposes necessitates an increased day pressure. I find, in my experience, that if large service meters are fixed, the pressure need never be more than 11-10ths to 12-10ths. There is no necessity for having a greater pressure on the distributing plant during the day than is actually required for all purposes. In Barrhead, we have done very little with the prepayment meter. One difficulty in the way is that proprietors purchase and keep in repair all meters. There are very great objections to this system, particularly when the meter comes to need repair or a new meter is wanted. We communicate with the proprietors, who object to the expense, and tell the tenant to get a penny-in-the-slot meter. Until this arrangement is cancelled, and the Company supplies and repairs all meters free, very little progress will be made with prepayment meters.

Sulphate of ammonia, as you are aware, has firmed in price during the last twelve months. Tar has also improved, and so has coke, which should help to compensate for the extra outlay on coal. Makers of sulphate will be in the happy position this year of being able to show a considerable increase in money arising from the enhanced value of sulphate—the profit from this product being close on £6 per ton, after allowing for all expenses in connection with its manufacture. Most of you would receive a pamphlet bearing on the Dalmeny experiments with sulphate *v.* nitrate of soda as applied to certain crops, showing how very superior sulphate has proved as a fertilizer. These experiments are opening the eyes of farmers to the superior value of this product. As time goes on the demand for sulphate will increase, and this residual will yet recover something of its former value. Sellers of crude liquor have not benefited so much as they ought to have done; and the sooner all works making over 20 million cubic feet erect sulphate plant, the better it will be for the companies owning the works.

In Barrhead, our stokers have eight-hour shifts all the year round. The men did not ask for the change; but when informed that the Directors were agreeable, they were, as you may suppose, highly pleased. We have had now nearly a year's experience of the new arrangement, and I must say I would not care to go back to the twelve-hour shifts. Strikes among gas-workers have been few, although some trouble has certainly arisen from the men demanding more money. This has been mostly confined to the larger works. It is pleasing to know that in almost all cases the men were met in a generous way by their employers. Unionism seems to be gaining ground in Scotland among gas workers. I for one have no objection to such a movement if the men will only use their new powers so as not to encroach on the rights of their employers, as I am sorry to say they too often do.

There is one other question on which I would like to say a word or two—viz., the standardizing of meter unions. It is now nearly five years since Mr. Myers read his paper on this important subject. At the meeting at which the paper was read, there appeared to be complete unanimity of opinion that steps should be taken to carry the proposal into effect. The Committee of the North British Association of Gas Managers took up the matter with energy, a meeting with the manufacturers was called, and they consented to co-operate with the Committee in carrying out the idea. Pattern unions were made, and a second meeting was held with the manufacturers, who expressed satisfaction with the couplings, and agreed to adopt them as the standard. The couplings were to come into use on Jan. 1, 1897. In 1897, the Committee, for the first time, discovered that standard couplings had been made some years before for the Board of Trade. The Committee endeavoured to arrange a meeting with one of the representatives of the Board of Trade, but failed. In 1898, it was reported that a circular had been sent to all the Associations of Gas Managers in the United Kingdom to take common action on the question. The idea was received very favourably indeed; and Mr. Carlow was requested by the Gas Institute to read a paper on the subject. After a time, the Associations, one after another, dropped the subject. I do not think, however, that we in Scotland should allow the matter to die a natural death after all the time and labour that have been expended. I have mentioned the matter to-day in order that you might have the opportunity of expressing your views as to whether or not we should carry out the first idea in Scotland only. If you are still of opinion that this desirable change should take place, I have no doubt the Committee of the North British Association of Gas Managers will see it carried through. I have refrained from saying anything regarding the advantages likely to result from such a change. These advantages are so well known to you all that any further remarks on my part would be quite uncalled for.

*Discussion.*

Mr. W. EWING (Hamilton) said they were greatly indebted to Mr. Carmichael for his able address. At the present time, the happiest faces he saw were those of gentlemen engaged in the coal trade. He could not help observing that there was a funereal aspect in the faces of the gas managers present. The price of coal, he supposed, had something to do with it. In the previous week, they were engaged upon their coal contracts

in Hamilton. Comparing prices with those entered into last year, there was an increase of fully 4s. per ton; and they had yet the dearer class of coal to contract for. This meant an increase for the year of fully £4000. It would, of course, have to be met by more rigid economy, if they intended to keep the price of gas as it was—which he had no doubt they would manage to do, being situated in the heart of the coalfield. Many would have to pay as much as 18s. for what they were paying 15s. 6d. There was also a great loss to gas companies and corporations in connection with street lighting. A meter attached to each lamp would be useless. The proper thing to have was a "Peebles" clock in the centre of each district. He had found this method to work, not in Hamilton, but elsewhere, with the utmost accuracy; but it was important that the clock should be watched. He had purified gas both by sending it up and sending it down through the purifiers. He had never experimented in the matter; but, so far as he could remember, it was about six to half-a-dozen with the two methods. Day pressure was another important item referred to. They could only have a low pressure during the day, if they had large enough gas-mains. Regarding the manufacture of sulphate of ammonia, they were in the unfortunate position at Hamilton of having passed plans for sulphate works, but not having erected them; and during the last year, they had lost, he should say, as compared with what they would have had if they had been manufacturing sulphate, something like £1600 or £1700.

Mr. J. Napier Myers (Saltcoats) congratulated the President on his appearance that day. He congratulated him also on his return to health; and he congratulated him on the very large programme he had brought forward for their consideration. One thing especially commended itself to him. That was his recommending a lowering of the standard of the illuminating gas supplied in Scotland. The President advocated—and he thought rightly—that the gas they manufactured in Scotland should not be of more than 20-candle power. He himself had had some experience in making 16-candle gas in England, for about ten years. Previous to that, he had some experience in Scotland in the manufacture of gas of considerably higher illuminating power. He had returned to Scotland, and was again making gas of higher illuminating quality than was obtained in England; and his experience had been that there was less occasion for grumbling in England—or rather, to put it another way, less grumbling took place in England about the quality of the gas supplied, than was the case in Scotland. Whether this was due to a difference in the characteristics of the people, or whether it was due to defects in the maintenance of an equable illuminating power, he was not prepared to say; but his experience in Saltcoats was that he had had very much more complaint there, in attempting to maintain 22-candle gas, than he even had in England, where the people were content with 16 candle gas. He would impress upon every gas manager that he should endeavour to obtain, and to maintain, a gas of 20-candle power. He had heard the case for higher quality gas, as stated there, to be that what the people wanted was light, not gas; but he thought that, since the introduction of the Welsbach gas-burner, what the people wanted was heat, not light. Mr. Ferguson Bell, in his Inaugural Address to the Midland Association of Gas Managers, said that his experience was that he failed to see any difference in the quality of gas as between 16 and 20 candle power, when used with the Welsbach mantles. More recently, Mr. Herring had said that the time was coming when they would not require to make illuminating gas at all. The same idea had occurred to him; and he thought that if Mr. Samson Fox had been a little later with his water gas, he would have met with much greater success than he did. If the Welsbach burner had been brought to the same perfection then as it had been now, and he had depended upon it for use with water gas, instead of on the Fahnehjelm comb, he believed the success of water gas would have been much greater than it had been.

Mr. W. R. Herring (Edinburgh) said that he came there as a listener, and had not the slightest intention of saying anything; but Mr. Ewing had raised a question, and Mr. Myers had mentioned a matter, which had a close bearing the one upon the other, and on the question of coal. He was quite sure the question was uppermost in all their minds, what they were to do during the coming year. There was no doubt they would have to face a substantial increase in the price of gas throughout the country. They knew that residual products were fetching a very high price at the present time; but they were not enhanced so much in value as coal happened to be. The question of dear coal was of importance, particularly when they bore in mind that the cannels upon which most of them were dependent for the high quality gas they supplied were now being worked out. It was a question whether they should not seriously take in hand the point which had been raised by the President as to the quality of the gas they supplied. He did not see how it was possible that they could continue to send out the high quality gas they did at the present price; and he would suggest that they should put to their respective committees or boards—or rather to the public—the question: "Will you have a lower quality at the same price, or the enhanced quality at an advanced price?" There was no doubt that the quality of gas at the present day was not so important as it used to be. He had been associated with works that supplied 14-candle gas, with works that supplied 18-candle gas, and now with a works that supplied 25-candle gas. He might say that, notwithstanding what Mr. Myers had stated as to English people not grumbling, he had found there was just as much grumbling as regarded the one quality as the other. In fact, it was not a question of quality—it was a question of how the people burned the gas when they got it. Take their case in Edinburgh. They went to the expense of making a high-quality gas, and then they consumed 2 cubic feet of it per hour in the public lamps, which gave a visible candle light sufficient to guide one by the wayside, but which, as an illumination, was a sham. It would pay much better to make a low-quality gas, and to burn about twice as much of it—particularly in regard to the incandescent burner, although a high-quality gas did give a better result than a low-quality gas. With an ordinary "C" burner, they consumed $3\frac{1}{2}$ cubic feet of 16-candle gas to obtain the best result; but he found that with 25-candle gas he attained the best result with $2\frac{3}{4}$ cubic feet. The initial difference was, however, so small that the people would be better with a low-quality gas than with a high-quality gas such as was common in Scottish towns. He was seriously thinking of raising the question, within a few months, of whether they should not reduce the quality and continue to supply at the present price of 3s. per 1000 cubic feet. There was still another point bearing upon this question. It would probably be known to all of them that Messrs. Bray had recently re-classified their burners. They obtained now from Nos. 1 and 2 burners what they used to secure from Nos. 3 and 4; and the public were asking for what they were used to. The consequence was that they were burning more gas, and getting more light, with somewhat larger gas bills. But they were always grumbling. He did not think they should take that seriously, because it showed a healthy state of mind.

Mr. T. Lighbody (Renfrew) said that his experience was that there were far fewer complaints regarding the quality of the gas than there were as to the amount of the gas bills. He thought they had a good deal to do themselves with the matter of the standardizing of meter unions. He had used something like six different makers' meters; and every one had the same union. He specified for one coupling, and he got it; and it was done without extra cost.

Mr. T. Douglas Hall (Montrose) said it had given him very great pleasure to be present that day to support Mr. Carmichael, who was an old friend of his, having been brought up in the same office with himself. He thought the subject which was most important to gas managers to-day was that of reducing the illuminating power of the gas. Like some of the former speakers, he had had experience of all qualities of gas—from 14 candles up to the old-fashioned 30 candles; and he must say that grumbling seemed to be less with the low illuminating power gas, as usually supplied in England, than it was in Scottish towns. He thought that some of the reasons for this were that, so far as he could see, the fittings in England were more modern, and the mains and service-pipes were larger. In English towns, burning 5 cubic feet of 15-candle gas per hour, the street lighting was most marked; but in Glasgow, for example, they would find old-fashioned, rat-tail burners, consuming about $1\frac{1}{2}$ cubic feet of gas per hour. These gave a light which simply let them see the lamp; there was no illumination at all. In his case, the average rise in the price of all classes of coal—first and second class cannel and splint—would be between 4s. 6d. and 5s. per ton; and he really did not see any other way out of his difficulty except to reduce the illuminating power of the gas to (say) 20 candles. With gas of this quality, and with care, and proper fittings and burners, he thought they would be able to give their consumers as much satisfaction as they were doing just now with 25-candle gas, and with possibly smaller service-pipes, defective fittings, and bad burners. Of course, he did not suppose that in Scotland—especially in the north, where they had to pay a very high rate for the carriage of coal—even if they did reduce the illuminating power from 25 to 20 candles, they would be able to tide over and pay dividends with the present price of gas. But he believed that gas consumers were quite prepared for a rise, because everything, without exception, was up in price. Who was benefiting by the rise in coal, he did not know; but he marked, like Mr. Ewing, the happy faces of the coalmasters.

Mr. D. Robertson (Dunoon) said that, although he might be considered rather extreme in his views, he thought it was not fair that coal should be exported from the country in such large quantities as was being done at present. Last year, he believed, there was exported from Great Britain 41 million tons of coal, out of a total production of 200 odd million tons. This coal could never be replaced. They were exporting what could not be renewed; and at home they were paying enhanced prices for coal in order to enable the foreigner to compete with them in British markets. He would put a duty upon coal, or prohibit its export altogether. In about 200 years, the British coal supply would be exhausted. None of them would be here to see that time; but it would be very hard on those who were alive then. He considered that they should look forward, and try to prevent this waste. Until some other motive power were secured, he thought they ought to conserve what they possessed. Unaccounted-for gas was a very sore point with most of them. Let them do what they might, they could not reduce it below a certain percentage. It was accounted for to a great extent by long stretches of mains and service-pipes; and he thought that the Committee of the North British Association, in compiling their statistical report, might put in a column showing the mileage of mains along with the percentage of leakage. He could not say that he was in favour of reducing the illuminating power below

20 candles; but he knew he had complaints when, as a matter of fact, the gas was very good. He observed that, if he could keep the gas of regular quality, even supposing it was not so good, there were fewer complaints.

Mr. J. M'Gilchrist (Dumbarton) said that to him the outstanding feature of the President's Address was the reference to illuminating power. Circumstances had changed; and no doubt they must meet the altered conditions by changing their modes of working. But to say that they were to maintain the present price of gas, with a reduction of the illuminating power, he thought was not going on right lines at all. He did not see how, by reducing the illuminating power, they were going to give the consumer better value. He thought that the present was an excellent opportunity for raising the price of gas to meet the increased cost of coal. So far as he knew, the coal producing lower illuminating power gas was relatively as dear as, or dearer than, the coal producing gas of higher illuminating power. The question for them was how they could give their consumers, per unit of light, the cheapest illuminant. He did not think that, by reducing the illuminating power of the gas, they could reach that. No doubt the incandescent burner had made the question of high illuminating power gas of less importance; but still there would not be 10 per cent. of the gas produced which would be consumed in incandescent burners. The other 90 per cent. would be consumed in ordinary Bray burners; and they ought to cater for that too. He knew that illuminating power was a great question; and they could not but see that the trend of public opinion among gas managers was in the direction of a reduction. He did not think they would be doing the best for their consumers by reducing the illuminating power, unless it could be shown—and that had never been attempted—that they could reduce the price of gas by doing so. It seemed to him strange that in England they had even less complaint about illuminating power than they had in Scotland. It appeared to some of the speakers to be of no importance whether they reduced the illuminating power 4 or 5 candles. To him, this was incomprehensible; he could not understand it at all. No one could dispute Mr. Robertson's remark about keeping the quality of the gas uniform; but he was sure that if Mr. Robertson had kept the high quality regular, there would have been no occasion whatever for finding fault. The same thing would happen as Mr. Robertson said he had experienced, if he were to reduce the illuminating power, and then on odd nights reduced it further. He thought it was all a question of cost. He did not see how they could meet the increased cost of coal without raising the price of gas; and he thought it would be an exceedingly unwise recommendation to give to their boards to reduce the illuminating power in order that they might keep the price as at present. Hamilton seemed to be a wonderful place. Mr. Ewing had told them that he could see his way to going on without increasing the price of his gas. This was to him incomprehensible. There must have been something very far wrong before, if he could go on now, with an increased cost of £5000, without raising the price of gas. Mr. Hall told them that if the fittings were put right they could supply low-quality gas with advantage. Surely it was of more importance that the fittings should be in good order for 25-candle or higher power gas. He thought the remark was begging the question, because the fittings ought to be right, no matter what the quality of the gas supplied. The exportation of coal was a question for Parliament, rather than for them; but there was a great deal of good sense in what Mr. Robertson had said in regard to it. He thought that the subject of the standardizing of meter unions had resulted unfortunately, because the North British Association had unanimously agreed to adopt the standard unions. It was a great pity that they had anything to do with the English Associations in regard to the matter. If they had continued in their own way—and more especially seeing that the six manufacturers of meters in the country were agreeable to give them the standards without extra cost—he thought that by this time they would have been proving to their English friends that the proper thing to have was one standard. He was very pleased to say that, out of seven Associations who were consulted on the subject by the Council of the Gas Institute, five were favourable to the standardizing of meter-unions. It occurred to him that there was something wrong in the action of the Gas Institute in not recommending to the members that the standardizing of the meter-unions should take place forthwith, seeing that so many Associations supported it. He would be very glad to support the North British Association if they again took up the subject of adopting standard meter-unions for Scotland alone.

Mr. D. Vass (Airdrie) said that he had had twice to raise the price of gas to meet difficulties; and his experience was that, immediately the price was raised, there was a falling off in the consumption of gas. If, on the other hand, they lowered the illuminating power, the opposite would be the result.

Mr. R. S. Carlow (Arbroath) thought it would be better to keep the illuminating power of the gas up to 24 or 25 candles, because, in places such as Arbroath, where there were mills, if there was the least reduction in the illuminating power they were at once rung up and asked what was wrong at the gas-works. Last year they went to Parliament, and got power to limit the illuminating power to 20 candles; but if he were to lower it to that figure, and were to tell the millowners that they had the power to do so, and had done it, but that the fittings in the mills were not proper, there would be grumbling all round. Electricity would then be introduced; and they would lose their gas consumption altogether. Certainly there was a spurt in the coal trade in the meantime; but he had passed through a similar situation before, and it might be done again. It was not so many years ago since they were paying 30s. and 40s. per ton at the pit for first-class cannel. That time passed by; and let them hope that the present high prices would, before long, do the same. Let them tell the consumers that they must raise the price of gas to meet the increased cost of coal, but that when the price of coal came back, there was the expectation that the price of gas would do the same. This, he thought, was the kernel of the whole affair.

Mr. W. Fairweather (Kilmarnock) said that for some time back he had been getting increased illuminating power by using shale, which he could purchase at 3s. or 4s. per ton cheaper than he could buy splint. He did not know, if he were to reduce the illuminating power, how he would get on. He was hedged in by Act of Parliament, and could not reduce the quality below 24 candles. Of course, it would not be a difficult matter to get sanction from Parliament to lower the illuminating power; but, at the same time, he did not see that he could make much by it. He was very pleased to hear chemical works mentioned. This was a matter of interest to everyone who had a consumption of over 20 million cubic feet. Two years ago, they put up a new sulphate plant at Kilmarnock, with the result that they had had an increased yield of something like 12 per cent. over what they had from the old apparatus. If anyone were going in for such plant, the more modern and substantial he put it up the better.

Mr. T. Wilson (Coatbridge) said that the increase in the price of coal was certainly something considerable. In his own case, it amounted to 25 per cent. over what he was paying a twelve-month ago. He was not like Mr. Ewing; he could not go back on rigid economy, because his works had been very well conducted in the past. He thought the only thing he could do was to add to the price of the gas. Unfortunately, in Coatbridge they had only 2½d. to rise before they reached their maximum. He thought they ought to reduce the quality of the gas. It was a great loss to the community that they should be supplying gas of 20 or 25 candle power when, for the great bulk of the consumers, 16 candles would be quite sufficient. The limit in Coatbridge was 20 candles, and he would like it reduced to 16 candles. He thought this would suit the majority of their people. He had supplied in England gas of 14 candles, and in Scotland of 25 candles; and really he had had as many complaints in Scotland as in England. Perhaps the Scotch were not so easily pleased as the English. He knew that, if he were allowed to supply gas of 16-candle power, he could make it much cheaper. His neighbour, Mr. Vass, raised the question of the increasing of the price affecting the consumption. With him, that was not so. He raised the price, as from Jan. 1 last, from 2s. 6d. to 2s. 8½d. per 1000 cubic feet; and in the two months of January and February, there was an increase of over 4 million cubic feet in consumption. He thought they should combine and get their standard in Scotland reduced to 15 candles. This would be in the interest, not only of gas companies and corporations, but of the community at large.

Mr. F. Waddell (Forfar) remarked that they supplied gas of 23 or 24 candle power in Forfar. It was, he believed, difficult to keep up a high standard of (say) 25 candles. He had not been making gas anything like that. His quality had been about 23 candles; and the people were perfectly satisfied. He had had far fewer complaints than when he supplied gas of higher quality. Notwithstanding that some of the mills in the town were lighted by electricity, the gas seemed to be quite able to look after itself. He must congratulate the President on the way he had put matters in his address. With regard to sulphate of ammonia, this was a sore point with him. His neighbour, Mr. Carlow, received about £1000 for his tar and liquor; and he (Mr. Waddell) got about as much for his tar and liquor as he should get for his tar alone. He could understand it; but the Corporation could not.

Mr. W. Blair (Helensburgh) said he thought he would be inclined to raise the price of gas to enable them to meet the extra cost of coal. If they were to make such a rapid change as to reduce the illuminating power of the gas by 4 or 5 candles, they would certainly increase the amount of grumbling, as well as the gas bills. Not many years ago he paid £2 10s. per ton for first-class cannel. They got over the difficulty then; and he did not see why they should not do so now. In a few years, coal would be back to its old price. He did not think that in Helensburgh he would be in the fortunate position of being able to economize sufficiently to meet the increased price of coal. He was rather afraid that they would have to raise the price of gas. So far as distributing plant was concerned, he was sorely hampered. He had a large mileage of mains per million cubic feet; and the leakage was, in consequence, very high. He believed it would be an advantage to have a column in their statistical report giving the mileage of mains. At Helensburgh, the gas passed down through the lime in the purifiers; and they had never been properly connected so as to drain away any liquid that might lie in the bottom. He had tested this frequently, and had found it standing at about 10° Twaddel. He thought they could always make cleaner gas by passing it up than by passing it down through the purifiers.

Mr. J. M'Nair (Wishaw) said he was in favour of reducing the

illuminating power of gas to 20 candles. His experience at Wishaw was that when he produced gas of 25 candles, there was always a good deal of grumbling; but if he made it of 20 or 21 candles, grumbling usually subsided. He thought it would be a very wise plan to reduce the quality perhaps 4 or 5 candles, if it were possible to taper it down. His opinion about purification was that the gas should go up through the lime, because, as it went up, it helped to keep the sieves moist, but when it was going down it dried up.

Mr. A. YUILL (Alloa) thought they ought to congratulate themselves upon having had so successful a meeting. The chief topic of discussion appeared to have been that of illuminating power. It did not seem to be a question of enrichment. They would all recollect the unique position he occupied in past years with regard to enrichment. When the point was oil *versus* coal, it was a question of how far up they ought to go; now it was a question of how low they were to go. He thought that if they were to reduce the illuminating power of the gas below what was supplied in London, they would find more difficulties than they had at present. In the paper which he read at the last meeting of the North British Association, he mentioned that about 90 per cent. of the gas consumed in the United Kingdom was of from 16 to 20 candle power. His opinion was that in places where they had a high standard of from 25 to 26 candles, no harm would be done to consumers in bringing it down to about 20 or 22 candles. They must all admit that circumstances had changed during the last five years or so. Gas cookers and fires, and incandescent lighting, had materially altered the situation; and they would be forced to the conclusion that a lower illuminating power gas was better suited for everyday requirements. At Alloa, he had two purifiers in which the gas passed up, and two in which it passed down; and he might tell them candidly that he could not see any difference whether it went up or down. But he was rather inclined to favour its passing up. For one thing, with the gas passing down, they had got all the resistance of the gasholders; and if there was any stoppage or back-pressure, it was thrown back on the point of entry of the purifiers, and there was a probability of the water being blown through the lutes. With the gas going up, they had the pressure behind the purifiers.

Mr. H. O'CONNOR (Edinburgh) said that the time he had spent about gas-works had always been where the illuminating power was less than it was in Scotland. From his experience, he found that the appearance of gas lighting in London was certainly better than it was in Scotland. The larger burners in use had the distinct effect of giving the appearance of a higher quality. If the illuminating power was to be lowered, the fittings in the houses would be too small, and the burners distinctly so. For a very long time after the lowering of the illuminating power, there would be a considerable number of complaints, owing to the smallness of the burners. It seemed to him that if a change were to take place it would be necessary, not only to issue, but to fix new burners free, so as to overcome the difficulty of the consumer wishing to retain and use the old burners. When he came to Scotland, he was particularly struck with the very small size of piping which was used in dwelling-houses. The pipes leading to gas-brackets and gasaliers were distinctly smaller than he had been accustomed to. He thought that, if the troubles there would be with these small fittings and the smallness of the burners could be got over, there would be no complaints from consumers if a lower quality of gas were sent out. The question of meter-unions, which he might be expected to touch upon, was not quite dead. It was still receiving consideration in certain quarters; and he could only repeat the remark of the late Mr. Bruce Peebles, at a meeting with the Committee of the North British Association of Gas Managers a year or two ago, when the question was in full swing: "It does not lie with meter makers; it lies with gas managers themselves. If you give me an order for a gross of meters, with any size of couplings you like to name, any number of threads per inch, any particular pattern you choose to decide upon, I shall certainly not refuse the order." He thought that this was really the point of the question. If a gas manager wanted his meters all with one union, he would have no difficulty in getting them; and he, for his part, having to manufacture meters, would have no objection to the standardizing of meter-unions.

Mr. M'GILCHRIST said he would like to know from Mr. Wilson, if he were to reduce the illuminating power of his gas to 15 candles, where he would get coal with which to make so low a quality. Would he send to the South of England for it?

Mr. WILSON said that the first and second-class cannel fields in Scotland were almost exhausted; and they had only the third-class cannel, splint, and some other gas-making coals left. They might get an analysis of a section of coal giving (say) 20 candles; but he was never able to get 20-candle gas out of any of these coals—about 16 candles was the quality they produced. Some of them, in the near future, might have to introduce water gas, which would help them considerably, because they would employ less oil. For low-quality gas, they would get delivered in their works coal at possibly 10s. per ton; but coal to produce 24-candle gas would cost perhaps 20s. per ton. The 10 candles were not worth double the cost. It was only a question of educating the consumers.

Mr. EWING, in reply to remarks which had been made since he spoke, said he had always been an advocate of low-quality gas, because he considered it more economical. He had supplied gas of 30 candles, of 15 candles, and of 10 candles. He had also supplied gas they could not see by at all; but that was abroad. He supported Mr. Wilson in advocating 15-candle gas as the standard for Scotland, because it was his opinion that, within five years, they would have to adopt it generally. They would probably have to use water gas, *plus* enrichment. At Hamilton, they were so situated financially that they were in a position to reduce the price of gas below 2s. 1d. per 1000 cubic feet, assuming a fair increase on the present year—and this notwithstanding that they were paying 115 to 120 per cent. more for coal than they did seven years ago.

The PRESIDENT, in closing the discussion, said that Mr. Fairweather might well enrich cheaply with shale, because it was at his door. He did not think, with Mr. Carlow, that the lowering of the illuminating power of gas would cause electricity to be introduced into mills. He believed that if burners were properly looked after, gas would be as favourably looked upon as electricity. He never for a moment thought, when he came there to advocate 20-candle gas, that he would carry so many of them with him; but the very fact of the larger towns going in for the power to reduce the quality, showed that in a short time it would become general. He thanked them for the support they had given him in the chair.

Mr. YUILL proposed that Mr. J. Wilson, Manager of the Tradeston works of the Glasgow Corporation, be appointed President of the meeting to be held in April of next year.

The motion was agreed to.

Mr. T. WILSON proposed a hearty vote of thanks to Mr. Carmichael for his services in the chair, which was also agreed to.

Mr. YUILL was re-appointed Convener of the meeting.

This closed the proceedings.

A large company of the gentlemen who had attended the meeting, and their friends, afterwards dined together in the hotel, under the presidency of Mr. Carmichael.

## NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

### The Annual Meeting in Boston.

(*Concluded from p.* 867.)

The subject of underwater gas-main construction was next announced for consideration. Mr. John A. Coffin, of Gloucester (Mass.), described, with the aid of drawings, a pipe-line carried under a tidal river which connects Ipswich Bay with Massachusetts Bay. It was a run of 12-inch cast-iron pipe, about 90 lbs. per foot lineal, with 4-inch sockets and ordinary lead joints. The pipe was securely strapped to a strong baulk of 10 in. by 14 in. pine timber, to protect it from being injured by the keels of passing vessels. The water went down to 2 feet or so at low tide; but the current was so rapid that a man could not work in it. A trench 2 feet deep was dredged out by means of a plough worked by a steam traction engine; and the pipe was joined up, slung on derricks on each bank, and lowered into place. In cutting the trench, a large boulder was encountered, which had to be removed by blasting. The pipe was laid with a fall, and a drip-box at the lower end, with a suction pipe carried through the rising pipe to the surface. But there was really nothing to pump up; the work proving bottle-tight after some months' use. Mr. Neal described a line of 4-inch flange wrought-iron piping, which was laid on the bottom of a tidal river 20 feet deep. The pipes were simply lowered to their place from a bridge; and a diver descended and made the joints under water. A level bed was first made for the pipes. This line had been in use for many years, and it hardly ever contained any condensation.

Mr. Gould gave particulars of a run of 20-inch cast-iron pipe, including an inverted syphon of 24-inch pipe, laid across, and under, Fort Point Channel, for the purpose of conveying gas to South Boston, from the city proper. The channel at that point was 700 feet wide; but was spanned by a bridge with a draw opening 36 feet wide, and the pipe was laid on piles above the surface of the water, except at the draw, where it descended 35 feet, extended 51 feet horizontally under the channel, and rose again. The whole extent of the syphon was enclosed in a very strong case of pine timber, 12 inches thick at the sides, and 6 inches top and bottom, 5 ft. by 4 ft. outside dimensions, and strengthened with iron bands. The space surrounding the pipe was solidly packed with cement concrete. There was a drip-box under one of the uprights; and a 4-inch wrought-iron pipe extending to the surface, in which an artesian well pump was fixed. But although this collected the condensation from the whole 700 feet run of pipe, it did not require pumping oftener than once a month. The joints were first caulked with cold lead, and some of them were further protected by cast-iron rings or sleeves caulked with tarred oakum and cement.

Mr. Slater produced drawings of a line of 16-inch cast-iron pipe carried across the Seekonk River. The nature of the bottom rendered it necessary to dredge out a channel 12 feet wide, drive piles in pairs at intervals of about 16 feet apart, and fix cross-pieces joining each pair of piles, to which the pipe line was strapped. The whole had to be kept more than 25 feet below low tide, as the river is dredged to that depth. The line was laid in sections of three pipes each; every third joint being made with one of Falcon's patent double strength ball

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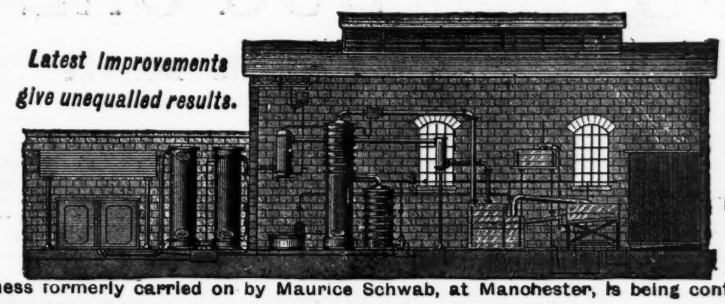

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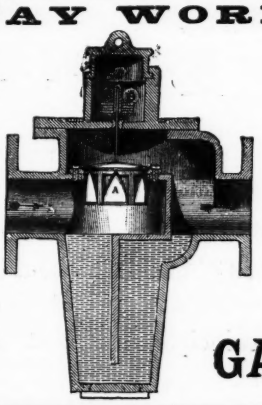

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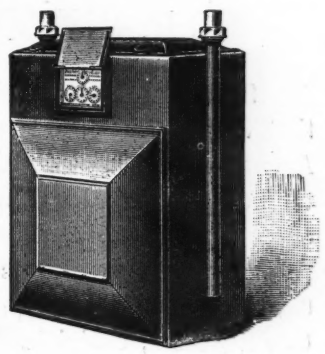

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joints, which was as strong as the pipe itself, easy to connect under water, and perfectly tight when caulked. Each section of pipe was lowered into place, and jointed and strapped down by a diver. The drip-box was 29 feet below low water; but the condensation was very slight, and the job was quite a success. Mr. Sherman had 800 feet of 16-inch pipe laid in exactly a similar manner; using the Falcon ball joint on every third pipe, and it was perfectly satisfactory. Another flexible joint was the Ward joint, which had been adopted with success for a 20-inch main laid under Haarlem River at New York, a width of 600 to 700 feet, and which could be put together on a raft, and paid out or lowered into place. Mr. Gould had laid 3600 feet of 6-inch cast-iron pipe, for water, using the Ward joint. The pipes were put together on a large raft and then allowed to slide off behind in four-length sections. Mr. Allen quoted a case where a line of pipes had been jointed by means of the Ward joint, on one bank of a river, and then pulled into place with the aid of a wire rope and a winch worked by horses. The joints were not caulked subsequently; but a diver descended and made the connections to the uprights on each side. Mr. Hirt had lately put down some very large pipe syphons—viz., one 54-inch on the Malden Bridge, one 48-inch at the River Street Bridge, and one 42-inch at the Charleston New Bridge. These were laid in wood-lined tunnels carried through the solid material below the bed of the river. The cast-iron pipes were laid concentrically, and the intervening space solidly filled up with cement; and he felt he had a job that would not be disturbed by ice or boats. The Malden Bridge tunnel was 850 feet long, and the Charleston Bridge tunnel was 260 feet long.

At the invitation of the President, Mr. A. B. Slater, junr., gave some details of a retort-house as re-constructed on the original site. The walls had to be taken down on account of failure in the foundations. The building, or rather the portion re-constructed, was 110 feet long and 65 feet wide, and contained two transverse stacks having ten beds of sixes in each, which were not disturbed. The form of building adopted was a steel-frame construction, with brick filling so arranged as to preserve a uniform appearance in relation to adjacent buildings. The roofing comprised four main trusses between the gables, 22 feet centre to centre, and trussed purlins 9½ feet apart; and the covering was the Melan principle of expanded metal and breeze concrete, about 4 inches thick, slated outside to match the other buildings. A wood centreing was used in the erection of the roof, forming a floor flush with the top surfaces of the framing, and covered with oiled paper to prevent the cement from adhering. The expanded metal sheets were laid on this and strongly fastened together, with a large lap, and a layer of concrete was worked in underneath them. The top surface was also covered and finished off smooth, and the slates nailed on in the usual way. He did not believe the slates would require repair; but if any were broken by accident, after some years, when the cement had set hard, there would be no difficulty in nailing fresh slates on.

Mr. B. J. Allen, of Alston (Mass.), read a paper on "Liquid Fuel," including illustrations of several burners suitable for consuming oil or tar. These were all on the injector principle, requiring steam or compressed air. The liquids were stored in a tank 20 feet above the level of the burner. He could maintain good, uniform heats and fix 100,000 cubic feet of carburetted water gas per retort per 24 hours, using ¾ gallon fuel oil per 1000 cubic feet of gas produced; and one man could attend to the set of 22 fires, and also adjust the feed to the 66 retorts. The oil thickened at about 15° above zero; so that, in cold weather, it was necessary to warm the storage tank by means of a steam coil. The lighter portions only of the water-gas tar could be used with nearly as good results; the heavier parts contained too much water, and he got rid of them by mixing with bituminous coal and burning under the boilers. He had also used a very heavy grade of fuel oil. This was stored in a tank 14 ft. by 16 ft., heated by means of a coil, comprising 190 feet of 1¼ inch steam-pipe. It was found necessary to keep this oil at a temperature of not less than 100°, and to deliver it to the burner under a pressure of 15 to 20 lbs. He also tried ordinary coal tar in the same apparatus, with varying pressures from 5 to 25 lbs. on the air supply, and also with steam at 100 lbs. pressure. The steam was adopted on account of trouble from clogging at the burner. The best results with tar were obtained with a simple injector burner made of ordinary wrought-iron fittings.

Discussion being invited, Mr. M'Kay said he had in one year consumed 500,000 gallons of tar for boiler fuel; using one of the burners referred to by the author—the Parson burner. Using three burners under a Hazelton boiler, he raised all the steam required on the works, and consumed 1000 gallons per burner per 24 hours, or ⅔ gallon per minute. This worked out to ¾ gallon per 1000 cubic feet of gas made; and the pressure of steam in the boiler was 110 lbs. His water-gas tar was practically free from water; and he found that the way to effect this result was to raise the mixed liquids to boiling point by means of steam coils. The tar and water would separate completely in 24 hours. The vent pipe of the heating tank was connected to the scrubber, so that any light hydrocarbons given off were returned to the gas. With the older imperfect apparatus the tar would stratify; but with the Lowe apparatus it was uniform. Mr. Sherman said he was successfully using oil-gas tar under retorts; and three barrels of tar were equivalent in fuel value to 72 bushels of coke. With coke at 3d. per bushel, the tar would be worth 6s. per barrel as fuel. He had a good demand for coal tar, but was only offered about 2s. per barrel for the oil-gas tar, which was made from a heavy oil of ·35 gravity. Mr. Prichard had used oil-gas tar under boilers, and found it worth about ¼d. per gallon, compared with steam coal at 12s. per ton. He was not successful, however, in separating all the water from the tar. Mr. A. B. Slater, junr., remarked that stratification of tar was due to incomplete fixing of the gas, and was therefore not experienced with modern apparatus.

After discussing the contents of the Question Box, the usual votes of thanks were passed, and the meeting was closed.

## GAS-ENGINES IN PRACTICE.

In an article which appeared a short time since in the "American Manufacturer," the above subject was dealt with by Mr. J. D. Lyon, as follows.

In districts where natural gas prevails, the power user has at his command in the gas-engine one of the most economical and convenient forms of power generator in existence. The rapid increase in the number of gas-engine plants being installed is ample evidence of the great practical value of the machine; and while the best estimate of the operating cost in any case can only be had from actual results in similar installations, a consideration of some of the conditions controlling the fuel consumption may be interesting.

The gas consumption in a properly constructed engine is very nearly proportional to the work being done—the friction load of the engine being always included. It is therefore the average useful work done *plus* this friction load that governs the gas consumption during any given period; and in estimating the cost of doing certain work, the average power required must be known with reasonable accuracy, if a close approximation is desired. In general, if $a$ = friction load (I.H.P. − B.H.P), $b$ = average useful work done in horse power, and $c$ = gas consumed per I.H.P. hour, the gas required for any number of hours $x = n\,c\,(a + b)$ where $n$ = the number of hours running.

Suppose in an actual plant with which the writer is familiar a 14 B.H.P. (17 I.H.P.) engine had a constant load equal to the full capacity of the engine. The consumption in this case is about 12 cubic feet of natural gas per I.H.P. hour; and the hours run monthly average about 300. The total amount of gas consumed would then be $12 \times 300 \times 17 = 61{,}200$ cubic feet, which, at $0·225 per 1000 cubic feet, amounts to $13·77 per month. As a matter of fact, the engine mentioned uses less than one-half this amount—the average monthly cost during 1898 being $5·65; the small quantity of gas consumed being due to the nicety with which the engine regulates the fuel admitted to correspond with the load. This engine is occasionally required to work very nearly up to its limit, furnishing power for electric lighting and for a heavy freight elevator, beside some light machine tools. Many other gas-engines are in use which show a fuel economy far beyond their owners' expectations; but, as a rule, these plants have been estimated upon maximum capacity, and it is the small average load that accounts for the low cost of running.

The figure given—12 cubic feet per I.H.P. hour—is a safe one when natural gas of about 1000 heat-units (B.T.U.) per cubic foot is employed; and a good gas-engine well adjusted should do somewhat better. On account of its cheapness and high calorific value, natural gas is an ideal fuel for the gas-engine; but the efficiency of the engine is so high that, even with higher-priced coal gas of lower calorific value, it remains cheaper to run in many cases than any other available motor. Average coal gas may be safely assumed to have a calorific value of 700 B.T.U. per cubic foot. With the same efficiency as before, and with gas at $1 per 1000 cubic feet, the running of the engine previously mentioned would cost approximately $36 per month, which is still a low price for service rendered.

As to the comparative cost of gas and gasoline for fuel (neglecting the cost of handling), 5·5 gallons of 0·76° gasoline very nearly equal in effect 1000 cubic feet of 700 B.T.U. coal gas. The cost of fuel only has been considered; but, of course, to this must be added attendance, lubricating oil, depreciation in value, repairs, and interest on investment.

When the average load is light in comparison with the maximum, and the latter is carried for a fixed period each day, it will sometimes prove economical to use two engines in order to reduce the friction load to be carried. For instance, supposing a plant in which 25 B.H.P. is required for two hours each day, and 5 B.H.P. for ten hours. With one engine of 25 B.H.P. (or 29 I.H.P.), the consumption of artificial gas would be 2426 cubic feet. If an additional engine of 5 B.H.P. (6 I.H.P.) were used to take care of the light load, the gas consumption would be about 1916 cubic feet; effecting a saving of $2426 - 1916 = 510$ cubic feet in 12 hours, or 51 c. per day if gas cost $1 per 1000 cubic feet. With low-priced natural gas, the argument in favour of a separate engine loses its force, unless the difference in power required at different fixed times is very considerable.

For years the noise-making proclivities of the gas-engine constituted one of the most serious drawbacks to its use in many localities. The modern engine has been much improved in this direction; but an observation of almost any plant in use will show there is still much to be done. The most objectionable

noises emanating from a gas-engine are air suction, exhaust, gear-wheels, snap of igniter, and opening and closing of poppet valves. The air suction causes a hoarse coughing noise during the charging stroke, and is not easily eliminated. Most engines are arranged to draw in their supply of air from a hollow base casting. The space between the base and foundation forms an air-reservoir communicating with the atmosphere of the room through a number of small holes or slits. The air passing through these small apertures makes less noise than when it is simply drawn into the cylinder through a plain pipe. It will be found best in many locations to carry the air-pipe to the outside of the building; and in this way the air suction will be made noiseless as far as the engine-room is concerned. When this is done, however, care must be taken to increase the diameter of the conducting-pipe, so as to allow for friction between the air and the walls of the pipe. Some English makers have secured fairly satisfactory results by making an air reservoir of the entire sub-base; the air velocity being reduced by means of a series of baffle-plates placed transversely in the base of the engine. When it is desirable to secure the same results in an engine not provided with such a base, it is, of course, easy to substitute for it a separate box arranged in a similar manner. As there is a possibility of an accumulation of a small quantity of an explosive mixture in the air-chamber, care must be taken to avoid danger from this cause. Since the quantity of air passing through an engine is considerable, caution should be exercised to provide an ample air-inlet to the engine-room. The writer has seen a case where a 25-horse power gas-engine in the basement of a building, by varying the air pressure, caused the front windows to rattle at every induction stroke when all the doors and windows were closed. It would be rare for annoyance to occur from such a cause, and it would indicate a state of ventilation calling for immediate attention.

Inconvenience arising from the air-inlet, however, is confined to the engine-room; but the exhaust-outlet, if not properly arranged, may become the subject for an injunction, and justly so. Several plans for minimizing this effect of the hot-air gases have been discussed. The sounds are due to the high velocity of these gases at the moment of leaving the exhaust-pipe; and all methods of silencing aim at a reduction of this velocity. As the pressure of the gases is due to their high temperature, it is best to employ some means of reducing the temperature rather than to obstruct their passage in any way. Expansion into large vessels immediately after leaving the engine is the common method; and if they are large enough, with large outlets, it is effected entirely. As the use of very large exhaust vessels is sometimes inconvenient, a part of the cooling water turned into the exhaust-pipe will be found to be an excellent substitute. The heat absorbed in raising a small quantity of cooling water to the boiling-point and converting it into steam greatly reduces the temperature and volume of the exhaust gases, and secures a practically noiseless exhaust. The method is not new; and it seems strange that it is so little in use, as it adds practically nothing to the cost of installation. The lowest point in the exhaust system must have a drain to carry off any excessive water when this method is used. The idea of reducing the velocity of the gases by means of baffle-plates, or any method depending wholly upon friction, is not so good; and unless they are placed upon the pipe at a considerable vertical distance above the engine, they will generally produce back-pressure.

The elimination of the other noises lies with the manufacturer, and all are working hard to improve in this direction. Buyers of gas-engines should note carefully the cause of all sounds coming from an engine; for although it is rare that the slight noise of the igniter and the valve opening in a modern engine is found serious enough to prevent its use, it may indicate excessive wear if it is not well designed.

## THE DISINFECTION OF WATER-MAINS.

At the Meeting of the Society of Engineers on Monday last week—Mr. Henry O'Connor, the President, in the chair—a paper prepared by Dr. G. Sims Woodhead, M.A., and Mr. W. J. Ware, on "The Disinfection of the Maidstone Water-Service Mains," was read by the latter, who is the Engineer of the Maidstone Water Company.

Our readers will probably remember that towards the close of the summer of 1897 a serious epidemic of typhoid fever occurred at Maidstone; and on the 11th of October one of the authors was called in to make a thorough inquiry into the outbreak, and to advise the Water Company as to its cause, and as to what steps, if any, should be taken to prevent its increase. It was considered advisable that certain precautions should be at once taken to prevent any further dissemination of the disease through the agency of the water supply, should it be found, after due investigation, that this was contaminated. The authors came to the conclusion that sterilization of the mains was necessary, in order (1) to do away with the possibility of any infective material that might have made its way into the mains remaining in any of the pipes, especially in the dead-ends; and (2) to restore public confidence, which could only be done by rendering it absolutely impossible for any such infective material to remain.

Owing to the arrangements for the distribution and supply of the water, it was a comparatively easy matter to disinfect one part of the system alone; but there were certain drawbacks in connection with the very steep gradients and high pressure at which the sterilizing solution had to be thrown in. After a careful study of the method of sterilizing with dilute milk of lime, as carried out at Worthing, and of Professor Delépine's experiments on chlorine disinfection, it was decided that the mains and service-pipes should be filled with chlorinated lime solution of a strength of at least 1 per cent., or $\frac{1}{3}$ per cent. of the available chlorine.

Chloride of lime was used because (1) of its comparative cheapness; (2) of its efficiency as a disinfectant, especially in solution—the double action of chlorine and oxygen being of special importance; (3) under the conditions presented, it could easily be obtained in a clear solution of the required strength; (4) it exerted comparatively slight action on lead; (5) its action on leather was supposed to be less than was afterwards found to be the case; (6) the odour could not be mistaken, and there could be no doubt when the chloride of lime had reached its destination; and (7) after the pipes had once been washed out there could not be the slightest danger of any ill effects following from the use of chlorinated water.

The high-pressure water was supplied from the Farleigh water (Kentish rag or lower greensand formation), with which surface relations appear to be easily brought about. It was decided to carry out the disinfecting operations in two sections, A and B. Section A included the Company's high-service pressure reservoir and the whole of the distribution mains of the high-pressure area north-east of this reservoir, including about $14\frac{3}{4}$ miles of mains with a capacity of a little over 76,000 gallons. In order to obtain a sufficient amount of solution, 180,000 gallons of water was left in the reservoir. To this was added 10 tons of chloride of lime, containing ·33 per cent. of available chlorine, which gave a strength of 4·04 grains of available chlorine per cent. The chloride of lime was thoroughly mixed with the water, and then allowed to settle for a couple of hours. The whole of the mains in the high-pressure area were then emptied, and the mains of each of the four districts of the section were in turn filled with the chlorinated liquor; the full pressure being maintained for half-an-hour in each. The entire mains and services of the high-level area were thus charged.

After this operation had been completed, the remaining solution was used to wash down the roof, walls, and piers of the service reservoir. Then, by means of constant stirring, the lime was mixed with the fluid, and a milk was formed which was pumped out of the reservoir by means of a fire-engine and run to waste. The operations commenced at six o'clock on Saturday evening, Oct. 16, and at six o'clock on Sunday morning, or twelve hours after starting, the chlorine solution was pumped back from the 12-inch trunk main from the town; the fire-engine being again brought into requisition. So long as chlorine water was returned, it was removed; and by eight o'clock the reservoir was being filled with bright, clear water, free from anything but the merest trace of free chlorine.

In most cases, the householders were thoroughly satisfied that the chlorinated solution had passed through their service-pipes; but there were a few streets in which the occupants of certain houses were not satisfied that they had received their full share of the disinfectant. In each of the streets from which complaints were received, the water supply was suspended and the mains emptied. The mains were then charged from the highest point with chlorinated solution stored in water-vans. The sluice-valve was opened, and the normal pressure was brought to bear so as to force the solution through the services and fittings of the selected houses.

Apart from some damage to washers, clothing, and pump-buckets, no ill effect of any kind was traceable to the use of the chlorinated lime solution. As the result of the treatment, everyone was satisfied that, so far as the mains and service-pipes that conveyed the high-pressure water were concerned, there was no possibility that any typhoid organisms could continue to exist in them.

In section B there were a little more than two miles of mains, of a total capacity of over 32,000 gallons, with a reservoir capable of holding 100,000 gallons. This section was treated in exactly the same way as section A; 3 tons of chloride of lime being added to 50,000 gallons of water left in the reservoir The process of disinfection was very similar to that adopted in connection with the other section.

In conclusion, the authors expressed the belief that this was the only instance in which disinfection of water-mains had been carried out on anything like so large a scale; and, although the difficulties to be surmounted were by no means small, they were thoroughly satisfied with the results. It was thought desirable to place on record their method of working in some detail, as they fully anticipated that similar operations might from time to time be necessary in connection with other outbreaks of typhoid, cholera, &c. As soon as it was announced that chlorinated lime solution was to be used, they received advice and offers of assistance from a considerable number of manufacturers of various antiseptics; and without denying that certain of these might have been used, probably with success, the authors were satisfied that with no single substance with which they were acquainted could they have felt equally certain that the disinfection could have been so thoroughly, quickly, and harmlessly carried out. The very fact that chlorine has an easily and well-recognized pungent odour was all in favour of the success of the undertaking.

# REGISTER OF PATENTS.

**Condensers.**—Kirkham, Hulett, and Chandler, Limited; a communication from F. D. Marshall, of Copenhagen. No. 6225; March 22, 1899.

This is a water-tube condenser, the elements of which (arranged one above the other) are composed of a series of sections secured together and so connected that "the cooling water introduced into the section at one end of one element will have to flow through all the sections of that element, from the other end of which it flows into the second element, after traversing all the tubes of which it flows into a third element, and so on—the cooling capacity of the apparatus being dependent upon the number of superposed elements, and the number of sections which such elements contain."

Fig. 1 is a side elevation of the condenser. Figs. 2 and 3 are a front and side elevation of the condenser with certain parts removed. Fig. 4 is a horizontal section on the line 4 of fig. 2. Fig. 5 is a sectional elevation of the means for feeding the condenser with ammoniacal liquor or water.

The casing of the condenser is preferably built up of wrought-iron plates and angle-irons, and provided with openings $A^1$ $A^2$ for the inlet and outlet of the gas and a pipe $A^3$ for the discharge of the tar and the like; B are the multitubular elements arranged in the casing, and C are the sections composing the elements. In practice, each section consists of a pair of water-tubes preferably more or less of oval shape, and connected at each end to cast-iron boxes D. These boxes have openings E at the sides and plane faces F, connected by tie-bolts G and box nuts; so that, when the boxes of the several sections of an element are all placed together, the cooling water will flow (for instance) through the tubes of the first section, as indicated by the arrow 1, thence into the tubes of the second section, thence through the tubes of the third section, and so on, whereby a zig-zag course is imparted to the water.

*Fig. 1.*

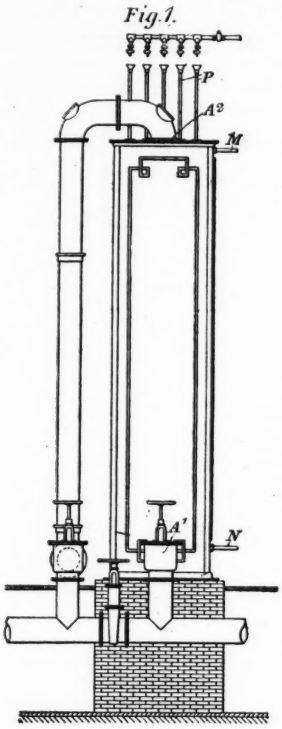



*Fig. 2.*

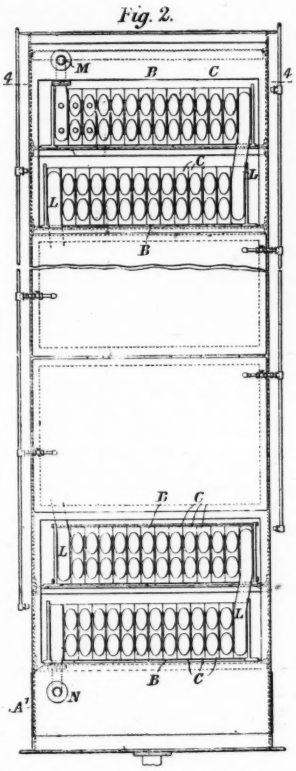



*Fig. 3.*

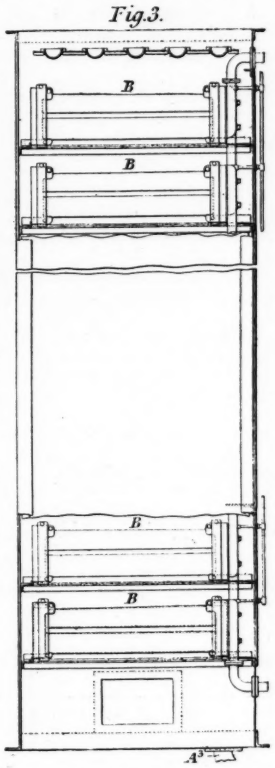



*Fig. 4.*

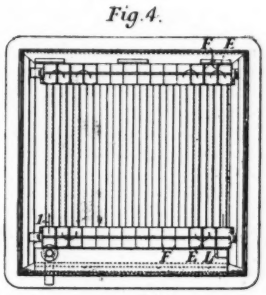
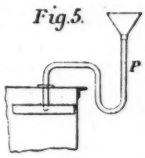



*Fig. 5.*




The elements are connected together by the pipes L (fig. 2), so that the water entering at M at the top will pass through the topmost element, and thence through the successive adjacent elements—finally emerging at N. The gas at the same time is caused to enter at the lower part, passes between the cooling-pipes of the various elements, and emerges through the outlet at the top.

In order to assist in the extraction of the ammonia from the gas, and remove the tar deposited in the condenser upon the tubes of the elements, there is an arrangement for passing a continuous stream of ammoniacal liquor or water through it. This comprises a series of tubes P, fixed to the top of the condenser, and provided at their upper ends with funnels for the reception of the ammoniacal liquor or water from pipes connected to the source of supply. The pipes are each furnished with a bend to form a seal; and their lower ends discharge into troughs having serrated edges, whereby the ammoniacal liquor or water is caused to fall through the condenser in the form of rain or spray.

**Apparatus for Charging Retorts and for Stirring and Withdrawing the Charge from Retorts.**—Foulis, W., of Glasgow. No. 8486; April 22, 1899.

This invention relates to apparatus of the type described in patents No. 12,016 of 1890, No. 14,440 of 1891, No. 12,385 of 1892, No. 16,749 of 1893, and No. 13,867 of 1895; the principal object being "to improve the apparatus so as to simplify its construction, and render it easily operated, very efficient in action, and not liable to readily get out of order."

As regards the apparatus for charging retorts: The patentee provides an arrangement by which, instead of tilting the whole frame to elevate the pusher, by which the charges are forced into the retort, the pusher and its rod only are elevated; and the operation is effected in such a manner that the leverage through which the power is applied to elevate the pusher is largely increased during the first portion of the movement. To effect this, the end of the pusher-rod nearest to the retort rests upon a roller or pulley, preferably grooved to fit the rod. This roller or pulley is suspended by levers secured to a cross-shaft mounted in bearings on the beam along which the longitudinally moveable parts travel; the shaft also having secured to it a lever to which is attached a rod operated by the plunger of a hydraulic cylinder, by means of which the shaft is rocked. When the roller or pulley is in its lowest position, the levers carrying it are perpendicular to the point of suspension, and therefore the leverage to lift the pusher is effectively applied.

The hydraulic cylinder is preferably arranged as follows: The ram of the cylinder is made so as to present a larger surface to the water at its rearward face than it does at its forward face; and the water is constantly in communication with the space of the cylinder forward of the ram. A valve (preferably a rotary valve, operated by a lever) is provided, so that, when the valve is in one position, water is admitted to the space in the cylinder to the rear of the ram to move it forward—owing to the surface of the ram at that side being larger than at the other side; and, when the valve is in another position, the rear space is opened to the exhaust, and the pressure of the water on the forward face of the ram moves the ram back, and the rod and lever and the roller on which the pusher-rod rests are operated to elevate the pusher for the back stroke.

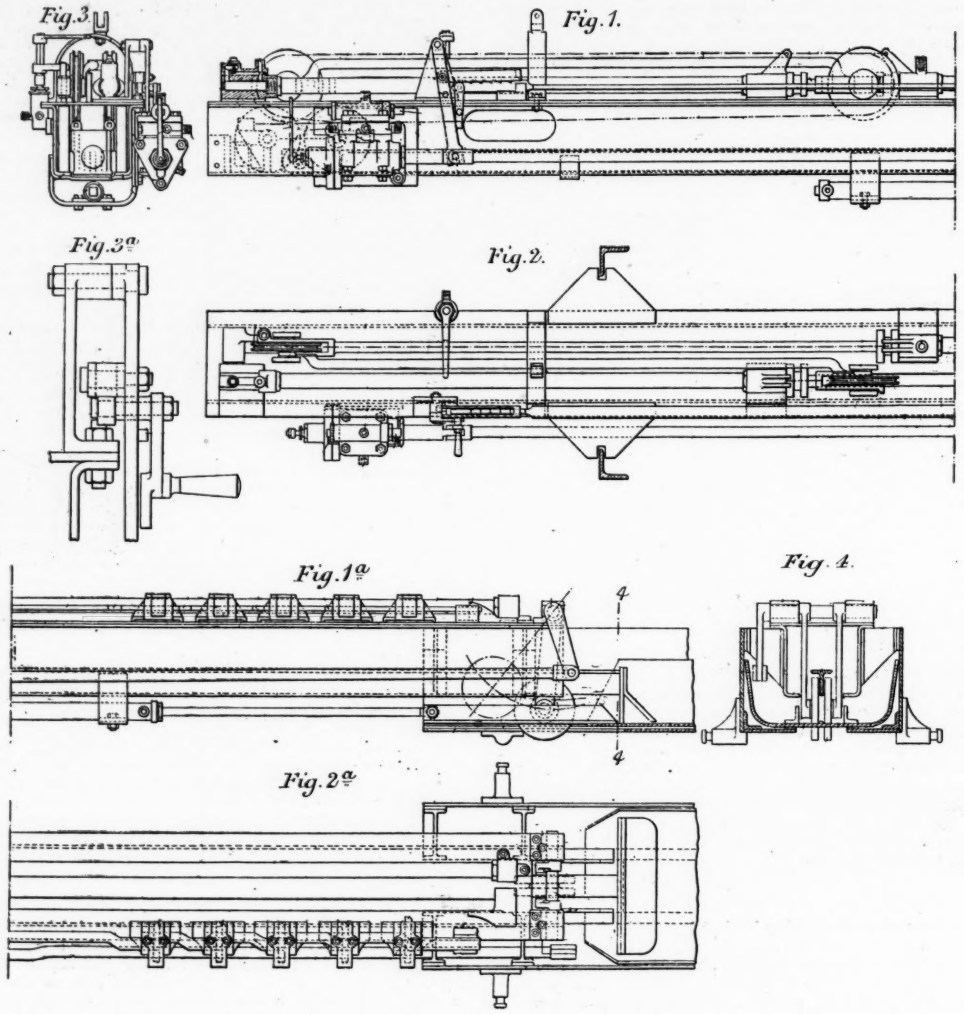
In connection with the cylinder, it is preferred to provide a second cylinder with a similarly constructed ram operating a slide-valve controlling the passage of water to the hydraulic cylinders for actuating the rams connected to the pusher. Thus, when the rotary valve is operated in one direction, the pusher is lowered and moved forward into the retort; and when it is operated in the other direction, the pusher is raised, and then withdrawn.

The stroke of the pusher has to be less at each succeeding stroke, as the first charge has to be put in at the far end of the retort, the next charge further forward, and so on, till the retort is charged. In order to effect this, a pawl is provided, carried by a lever which is moved by the rod which operates the roller or pulley which raises the pusher, and which pawl engages with notches or projections in, or on, a rod, and at distances apart corresponding to the stroke of the pawl. This rod at its forward end is provided with inclines, which are arranged so as to successively act upon stops to project them in the requisite order to stop the pusher, so as to allow it only to take the successively shorter strokes. The first stroke of the pusher may be stopped by a fixed stop. At the next stroke, the pawl engages with the forward notch or projection in, or on, the rod, and the forward incline projects the forward moveable stop, and at the next stroke the pawl engages with the next notch or projection in, or on, the rod, and the next incline projects the next moveable stop, and so on. When the retort is charged, the rod is drawn back by a hinged handle, supplied for the purpose; the rod being provided with other inclines, which then withdraw all the moveable stops ready for the next operation. The hinged handle is furnished with a cam or nose, which lifts the pawl, and also with a projection which rests on a stop on the lever carrying the pawl, and holds up the handle (and consequently the pawl) till the first stroke of the next charging operation is commenced.

The guide or beam along which the reciprocating parts travel is preferably formed like a hollow girder (or of box form, in cross section), with a longitudinal slot at its underside; and the travelling parts are provided with rollers which run along in, or on, the girder or hollow box. Apparatus for stirring or drawing the charges of retorts can have the reciprocating parts and the guides or beams on which they travel similarly arranged.

The hydraulic cylinders and rams by which the pusher is operated are preferably provided with a cushioning arrangement, which confines a certain amount of water in the cylinder at the rear of the ram, for the forward stroke in retort chargers, and at the rear of the ram for the back stroke in apparatus for drawing retorts, and prevents shock. This arrangement consists of a passage for the water having two branches, one opening into the rear end of the cylinder, and the other into the cylinder at a short distance in advance of the rear end; a valve being arranged between the two branches, which closes the passage for water in the direction from the rear to the forward branch, but allows of the free passage of incoming water through the rear branch. When the ram approaches the end of its back stroke, and after it passes the forward branch passage, water is confined between its end and the end of the cylinder, and can only pass slowly between the ram and the cylinder, or by a restricted passage provided for the purpose. But, when water is admitted to the cylinder, it can pass through the valve to the rear of the ram to start the stroke.

Fig. 1 is the left-hand end, and fig. 1A the right hand end, of the




apparatus above described, partly in side elevation and partly in longitudinal vertical section. Figs. 2 and 2A are similar portions of a plan of the apparatus. Fig. 3 is an elevation of the left-hand end of fig. 1. Fig. 3A is a view of a detached portion of fig. 3. Fig. 4 is a transverse section on the line 4 of fig. 1A.

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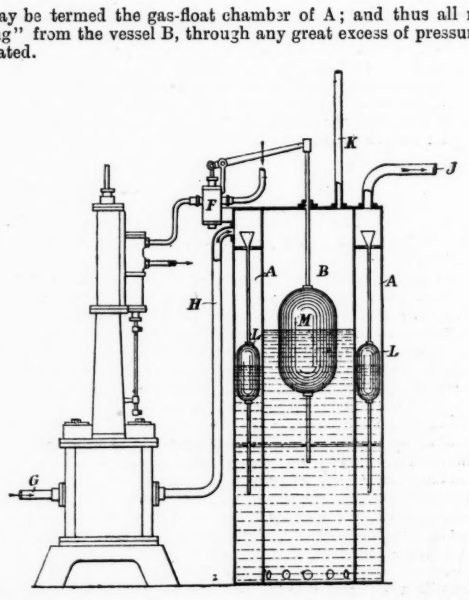
**Regulating Gas Pressure in Incandescent Gas-Lighting.**—Sugg, W. T., of Regency Street, Westminster. No. 9126; May 1, 1899.

This invention relates to means for regulating gas pressure in incandescent gas-lighting by employing two gas-tight vessels of equal area, to contain water, and connected at the bottom—one vessel to receive gas under pressure, and the other to contain a float connected to a cut-off device—an excess of pressure in the gas-vessel forcing the water into the other vessel, so as to raise the level of water in it, and lift the float, which thus operates the cut-off device. The arrangement was referred to, and illustrated, in the "JOURNAL" for March 13 last, p. 680.

The gas enters the compressor, shown in the engraving, by the pipe G, and passes out to the regulating device by the pipe H. The gas enters the vessel A near the top, and passes out at J to the installation. K is a pipe by which any gas that might "blow" through the water in the vessels A and B may escape to the outer air. L are two floats (with guide rods) placed in the vessel A. The lower rods are steadied by guides, while the upper ones pass through openings in a horizontal partition, forming seats for conical valves carried by the float guide-rods. M is a single float, with suitable guide-rods, contained in vessel B. The upper rod passes through a gland in the top of the vessel, and is connected to a lever intended to operate the cut-off device for the water supply.

When it is desired to work the apparatus, both vessels will be filled with water to a certain height, and the gas-cocks to the several burners of the installation turned on. The apparatus at once commences to work, because the pressure will be relieved, the float M will descend, and, by its weight, open the cut-off device F for the water supply. When, owing to the continuous pumping, the pressure in the vessel A exceeds requirement, the water therein will be forced into vessel B, the float of which will rise, and turn off the water supply F to the pump more or less, or entirely. At the same time, the gas-floats in A will descend, and the conical valves will more or less (or entirely) cut off the gas supply to what may be termed the gas-float chamber of A; and thus all risk of "blowing" from the vessel B, through any great excess of pressure, will be obviated.




By the expression "means for regulating gas-pressure," the patentee says he wishes to be understood, in the present connection, "a device, or series of devices, which will automatically throttle the supply of power to a motor so soon as the pressure in a reservoir into which the gas is

being pumped by the operation of the motor exceeds a certain limit, and which will automatically operate to open the supply of power to the motor, so soon as the pressure decreases."

**Gasholders for Equalizing Intermittent Gas Production and other Purposes.**—Glasgow, A. G., of Victoria Street, Westminster. No.9493; May 5, 1899.

In explanation of the object of his invention, the patentee remarks that in plant which produces gas intermittently—in order to practically equalize the rate of subsequent treatment (as, for example, purification and measurement), and to avoid frequently stopping or adjusting the exhauster which drives the gas forward to the main gasholder—there is sometimes interposed in the gas-main, between the generator and the exhauster, an equalizing gasholder or reservoir in which gas accumulates during the period of production, in order to supply the exhauster when gas making has ceased, as during the time the generator is being blasted. With such an arrangement, there is the danger, if the generator be shut off too long, or the speed of the exhauster be too great, that the exhauster will empty, and tend to create a vacuum in the equalizing holder, and so cause its collapse. The object of the present invention therefore is to obviate this danger, for which purpose a valve is provided adapted to close the outlet-pipe of the holder as soon as it has descended, owing to the gas being exhausted, to a given position in the tank.

*Fig. 1.* *Fig. 2.*

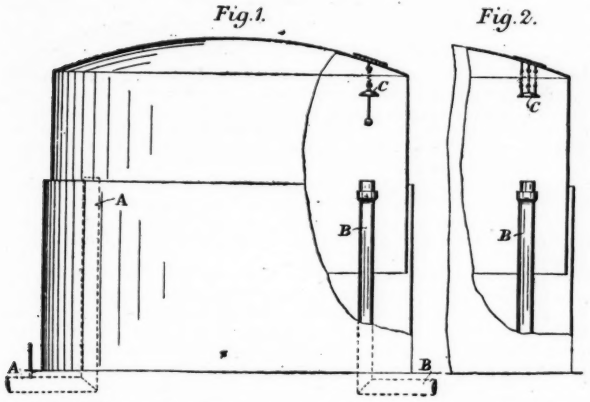



Fig. 1 illustrates (in section) an equalizing gasholder, provided with a valve adapted to close the outlet therefrom when the holder has descended to a given position. The holder is provided with a gas inlet-pipe A, in communication with the generator, and with a gas outlet-pipe B, connected to the exhauster. C is a valve or lid provided with a central eye, whereby it is attached, through a chain, to the cover of the manhole usually formed in the crown of the holder above the outlet-pipe. This valve or lid is faced on its underside so as to rest upon, and make a tight joint with, the open end of the outlet-pipe, when the holder has descended to a given position, and is provided with a weight to ensure it seating properly upon the pipe.

*Fig. 3.*

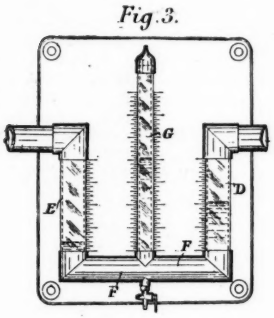



Fig. 2 shows a modified arrangement, wherein the valve or lid is connected by three or more chains instead of by only one chain; or it may be attached in any manner that prevents the weight of the holder being upon the pipe, and enables the valve to properly seat itself.

In some cases, a single pipe serves as both the inlet to, and the outlet from, the equalizing holder; since the valve or lid being loosely connected to the holder, will be lifted from the closed pipe by the pressure of the incoming gas, whereupon this pressure will act upon the entire area of the crown, and cause the holder to rise.

In the event of the valve or lid not making a tight joint, the exhauster might so far reduce the pressure in the holder as, in the course of time, to cause its collapse. In order to prevent such an occurrence, there is provided in connection with the holder, an arrangement whereby gas is automatically admitted to the holder, from the mains or elsewhere, upon the pressure in the holder being reduced below a predetermined point. Fig. 3 illustrates such a device in which D E are a pair of vertical tubes, communicating at their lower ends through a tube F. The tube D is connected by a tube to the gas-store or distributing-main, and the tube E is connected by another pipe with the holder, as, for example, by the inlet-pipe. G is a pipe the lower end of which is connected to the tube F; while its upper end is open to the atmosphere through a perforated cap. The tubes D, E, F (and G, when used) are partly filled with liquid—say, coloured glycerine. On the pressure in the holder being reduced to, for example, two or three ounces below atmospheric pressure, the liquid will be forced out of the pipes D, E, F into the inlet-pipe by the pressure of the gas, thereby allowing gas from the main to enter the holder, and prevent the pressure therein being further reduced. By combining suitable scales with the tubes D, E, G, the device will serve as a gauge for indicating the pressures in the holder and distributing main or vessel.

**Hydraulic and Foul Mains, &c.**—Robus, H. J., of Bucklersbury, E.C. No. 25,374; Dec. 21, 1899.

This invention relates to hydraulic mains, foul gas-mains, and other pipes and vessels situated above retort-settings in gas-works; and it has for its object to cool and regulate the temperature of these pipes and vessels by water-jacketing them, and automatically actuating and controlling the flow of jacket water so as to regulate the temperature of the contents of the mains. The invention further consists in supplying a water-jacket for cooling purposes to the bottom and (if desired) the sides of coal-bunkers, which may then be placed directly above the retort-setting, and also in automatically actuating and in controlling the flow of this jacket water. An illustrated abstract of the specification appeared in the "JOURNAL" for Feb. 27 last, p. 540.

**Incandescing Media.**—Nielsen, R. A., of Copenhagen. No. 2672; Feb. 10, 1900.

The patentee points out that, in the manufacture of the ordinary type of incandescent mantles, the attempts which have been made to impart to the particles of ash of the rare earths such a degree of cohesion that the mantles will bear transport, have not led to satisfactory results; and the attempts which have been made to provide the incandescing substance with a firm support of refractory material have been "equally unsatisfactory." Supports or carriers of platinum wire do indeed, as he remarks, give a durable network; but, by reason of the high thermal conductivity of platinum, the illuminating effect of such mantles is far inferior to those which have no platinum support. Other trials have been made with supports or carriers of a number of naturally occurring refractory bodies—such, for example, as quartz and asbestos; but the inventors of these mantles have, he says, omitted to observe that while these substances, when they are in pieces of considerable size, will easily and for a long time withstand such a temperature as is produced by the bunsen flame, yet they are nevertheless acted upon injuriously when they are exposed thereto in the form of threads. He claims to have found, by experiment, that even tolerably thick asbestos threads will melt as soon as they are brought into the bunsen flame. Threads 0·3 mm. in diameter of rock crystal, which (as is known) only melts in the oxyhydrogen flame, will soften in the bunsen flame, and after about 50 hours are burnt through. The reason that these refractory substances are so little durable is that they soften and volatilize, which, in the case of rock crystal, has been shown by Professor Henri Moissan to occur at a temperature of about 1200° C.

The specification continues: "Until the most recent times, the oxides of the rare earths and of the metals of the alkaline earths, as well as of the elements zirconium, thorium, molybdenum, tungsten, uranium, titanium, vanadium, niobium, and tantalum, have been regarded as infusible. These oxides, which must be produced in the laboratory in order to be of the necessary purity, can only be fused by the enormous heat of the electric arc in the electric furnace; and they are not influenced chemically by the electric current. Shortly before they reach their melting point, they soften; and I have found that if, while they are in this condition, they are touched with a solid body, and this be then quickly withdrawn, a fine thread of the fused oxide will adhere, and be drawn out by the solid body, which thread instantaneously sets, and can be wound. A characteristic feature of my invention consists in the employment of these threads for the manufacture of mantles and other incandescing media for illuminating purposes. In order to increase the radiant surface of the mantle or other incandescing medium composed of these smooth threads, and thus increase the illuminating power, the threads of the network are preferably coated with a pulverulent coating of one, or it may be with mixtures of two or more of the oxides above enumerated; this being effected by immersion in a solution of a suitable salt or salts, and subsequently drying and raising to incandescence. If this operation be carried out several times with a dilute solution, greater resistance and solidity will be imparted to the coating."

## APPLICATIONS FOR LETTERS PATENT.

5626.—ROWBOTHAM, W., "Generating acetylene gas." March 26.
5663.—EDGAR, W., "Street-lanterns." March 26.
5688.—MUNDY, C., "Gas and like engines." March 27.
5711.—KLEIN, O., "Manufacture of acetylene gas." March 27.
5738.—GUNNING, J., "Gas-cocks." March 27.
5767.—STANLEY, E., "Globes." March 28.
5769.—BERNT, J., and CERVENKA, E., "Gas-burners." March 27.
5774.—NEW, A. G., "Internal combustion engines." March 28.
5780.—BRAY, J. W., "Incandescent gas-burners." March 28.
5783.—EDGEWORTH, T. F., "Gas heating-stoves." March 28.
5817.—JAVAL, E. A., "Generating acetylene gas." March 28.
5821.—DE LÉRY, J. B., and RICHARDSON, C. G., "Incandescible elements." March 28.
5822.—WALKER, S. S., "Reducing and controlling the flow and pressure of gases." March 28.
5863.—SCAIFE, R., and RIDE, S., "Drilling and tapping machines." March 29.
5926.—MARKS, G. C., "Incandescent gas-burners." A communication from the firm of Julius Pintsch. March 29.
5945.—WHITEHEAD, T. L., "Diminishing or increasing the light of a gas-jet from a distant position." March 30.
5969.—BRYANT, C. H., and ROESSLER, A. C., "Compressing gas and other fluids." March 30.
5979.—BILLING, M. B., "Low-pressure gas-governor." March 30.
5989.—THOMPSON, W. P., "Incandescent mantles." A communication from W. Karsten. March 30.
6016.—MANDER, G. G., and GILL, A., "Anti-vibration devices for incandescent gas-burners." March 31.
6019.—MOORE, J., "Street-lamps." March 31.
6038.—RATHENAU, W., "Manufacture of calcium carbide." March 31.
6050.—WEGENER, C., "Production of heating gas." March 31.

**Sale of Shares.**—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold some £10 "C" shares in the Harrow and Stanmore Gas Company (last dividend at the rate of £5 12s. per cent. per annum) at prices ranging from £11 10s. to £12 each. Some original stock of the King's Lynn Gas Company, carrying 10 per cent. dividend, fetched £200 per £100 of stock; the purchaser taking the dividend from the beginning of the year. A small parcel of consolidated "C" stock of the Croydon Gas Company (last dividend 9 per cent.) was sold at the rate of £217 per cent.

# CORRESPONDENCE.

*[We are not responsible for the opinions expressed by correspondents.]*

## Naphthalene in Coal Gas.

Sir,—May I be permitted a few last words in reply to the several letters on the above subject in the "Journal" for the 3rd inst.?

Careful consideration of my experiments at 15° C., has led me to think that Mr. W. Irwin is perhaps right in claiming that his figures for the vapour tension between 15° and 25° C. are nearer the truth than my own. His, however, I still think are too low owing to the much too rapid passage of his gas, and perhaps to the impurity of his naphthalene. The experiments I made at 15° C. were too few in number to satisfy me altogether. The accuracy, however, of the values actually observed at and above 30° C. is amply assured by the great number of completely concordant experiments made. Any errors detected by differentiation in the V.Ts. at temperatures intermediate between those of experiment, are due solely to the inevitable error incident to reading such large numbers off any diagram on however large a scale. Mr. Irwin's method of testing for naphthalene is, I think, more cumbersome, tedious, and inaccurate than my own, which, in turn, seems inferior to that of Dr. Colman, if it be as accurate and easily carried out as he claims.

Mr. Leicester Greville is quite right in stating that my theory is not absolutely proved until it has been experimentally demonstrated that naphthalene can be formed by the interaction of the constituents of coal gas in a way possible under the conditions existing in gas-mains. That I had reason to believe that this was possible, I stated when reading the paper. Within a few months I hope to settle this point definitely. If I cannot then substantiate it, I shall be ready to acknowledge my error. I should, however, like to point out that never have I said that all naphthalene deposits were formed in this way. I was careful to claim only that it would satisfactorily account for the otherwise inexplicable deposits that are often formed (as, for instance, in the case of the Auckland gas).

I have also to thank Mr. Greville for again pointing out an error in the "Journal" report of the paper, which had already been detected by Mr. Leather. The 1·25 cubic feet should, of course, be 100 cubic feet; and the temperature 113° Fahr., instead of 130° Fahr.

In conclusion, I can only thank my numerous critics for the kind way in which they have discussed a theory so opposed to their own views and practical observations, and for the benefit I have received from their experiences.

*Guy's Hospital, April* 6, 1900. R. W. Allen.

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Sir,—In his letter published in your last week's issue, Mr. Leicester Greville points out an apparent discrepancy as to the solubility of naphthalene picrate in the paper recently published by Mr. J. F. Smith and myself. The matter is capable of ready explanation. The figures for the solubility of naphthalene picrate were obtained by allowing water to stand over an excess of the finely-powdered substance for several days, with frequent shaking; and the amount of naphthalene picrate in the saturated solution was then determined. When washing the picrate on the filter with water, the latter is in contact with the crystals for so short a time that it does not become nearly saturated; and hence the actual amount dissolved is much less than that calculated from the maximum solubility of naphthalene picrate. The latter compound separates from the hot solution on cooling in long, very thin needles, which frequently extend through the whole mass of liquid, and would render difficult the carrying out of the modified method proposed by Mr. Greville.

With regard to Mr. Greville's statement that "the normal amount of naphthalene present in ordinary gas is so small as to range from *nil* to 1·5 grains per 100 cubic feet," I would point out that no such statement occurs in our paper. It is there stated that this was the amount found during the last few months—*i.e.*, the winter months, in which the temperature of the gas has always been below 60° at some point of the plant. It is probable that the amount will rise as the average atmospheric temperature rises, and that it will be considerably higher in the summer. Moreover, I do not think that any such general conclusion can be safely drawn, even for winter months, from tests made in one place only.

Mr. Greville states, also, that it is not likely that naphthalene would be formed to any extent by the breaking up of liquid paraffins into permanent gases at high temperatures. I am unable to agree with this statement, as Russian "Solar" oil does yield large quantities of naphthalene if the temperature is sufficiently high; and the resulting gas may give trouble from separation of naphthalene. The Russian oil consists chiefly of naphthenes; but I have very little doubt that the paraffins would behave in a similar manner, except in so far as a rather higher temperature would be necessary.

*City Gas-Works, Saltley, April* 5, 1900. Harold G. Colman.

## The Future of Electrical Supply.

Sir,—In the comment upon the future of electric supply in your issue of this week, you have inadvertently misinterpreted the figures in the article from which you quote as to the efficiency of the distribution of electrical energy. You say: "If we interpret Mr. Adams's figures aright, at least 3½ times the energy must be generated at the prime-movers that will ever be accounted for at the consumers' terminals." What Mr. Adams pointed out in his article was that, for unit-energy sent out from a distributing station, you would need an electrical equipment—namely, generators, transformers, and rotary converters—representing a total capacity of 3·34 units; but the energy *generated* by the main dynamos for unit-energy sent out from the rotary converter at the distributing station would be 1·23 units, not 3·34 units.

The basis of comparison adopted by Mr. Adams is not complete. Clearly his gas-engine and dynamo at a sub-station take the place of the rotary converter. Hence the gas delivered through the pipe to his sub-station plant must be considered analogous to the electrical energy transmitted through the transmission line. Thus the gas generator must be taken as representing the main dynamos. But Mr. Adams only compares the combined efficiency of the gas-main and gas-dynamos with the combined efficiency of the main dynamos, step-down transformers, transmission line, and rotary converter. The efficiency of the gas generator should be introduced in the first combined efficiency, which would apparently turn the scale in favour of purely electrical transmission.

But Mr. Adams does not carry his comparison back sufficiently far to reach a common basis. Efficiencies are all very well as mathematical concepts; but if the prime source of energy in one set of circumstances is twice the price of that in another set, it will take a large saving in efficiencies to make up the difference. Mr. Adams's figures should be reduced to the basis of coal at the pit mouth (let us say), which is the starting point in your leading article. In these circumstances, the following efficiencies have to be considered in addition to those referred to by Mr. Adams:—

| *Gas Power.* | *Steam Power.* |
|---|---|
| Efficiency of generator. | Efficiency of boiler.<br>Efficiency of engine. |

And in the computation of relative capital outlay per unit distributed, the following further items would have to be taken into account:—

| *Gas Power.* | *Steam Power.* |
|---|---|
| Cost per unit of generator, plant, and buildings.<br>Cost per unit of gasholder. | Cost per unit of boiler, engines, buildings, and accessory plant. |

28, *Victoria Street, S.W., April* 5, 1900. Ed. C. de Segundo.

## The Price of Gas and the Value of Residuals.

Sir,—Your editorial on the price of coal and gas is well-timed, and calls for the careful consideration of all gas producers. With the present high price of coal, and the probability of further firmness, the difficulty seems to be to estimate the advance that should be asked for gas, so that the consumer may be as leniently dealt with as circumstances permit, and still due regard be paid to the interests of shareholders and ratepayers. In such an estimate, it is perhaps unwise to calculate too freely on the value of the residuals (which are a fluctuating factor); but in the case of coke—the value of which is, to a large extent, regulated by the price of coal—it may be hoped, and reasonably expected, that, while coal remains high, coke, which after all is the most important residual, is not likely to fall.

But, is the most being made of the coke, especially where the production of water gas is installed? It would be interesting and instructive were some of your correspondents having experience in the manufacture of water gas to give some facts and figures as to the cost of it at to-day's prices of coke and solar oil, as compared with coal gas pure and simple, or the product of an extra yield of low-illuminating power enriched by benzol. Where the gas-producing plant is inadequate, there can of course be little choice; but many who may be considering the erection of water-gas plant would be glad of such a comparative statement. Even with coal at its present high price, it seems open to question whether carburetted water gas can be produced as cheaply as coal gas itself, or as low-power coal gas otherwise enriched.

*April* 6, 1900. Lux.

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**The Heckmondwike Gas-Works Purchase Question.**—It was reported to the Liversedge District Council yesterday week, that the Sub-Committee who had been appointed to consider the question of the purchase by the Liversedge and Heckmondwike Councils of the undertaking of the Gas Company favourably entertained the proposal. It was decided to confer with the Heckmondwike representatives with a view to ascertaining, without prejudice, what terms, if any, the Company would be prepared to accept for the concern. The Heckmondwike Council have unanimously ratified the decision of the Finance Committee to take preliminary steps, in conjunction with Liversedge, to acquire the works.

**A Cornish Gas-Works.**—A meeting of the shareholders in Messrs. Lawry, Hawke, and Venning, Limited, general merchants, was held at Callington, Cornwall, on Thursday. Among other businesses carried on by the Company is that of manufacturers of gas. In regard to this, it was reported that a large demand had arisen for gas cooking-stoves at Gunnislake, and about 50 were provided, with the result that the consumption of gas had increased about 20 per cent. This involved an expenditure of £300, which had been borrowed. Further outlay for the same purpose was required, as well as for putting in new retorts and replacing some of the mains. In view of the fact that the Company were trading largely on borrowed capital, the Directors recommended that the gas-works should be disposed of, if a satisfactory price could be obtained. The Chairman (Mr. J. W. Lawry) stated that the stock of coal was valued at Christmas at £120 more than it cost. But for this fact, there would have been a loss on the year's trading. The report was adopted.

**The Increase in the Price of Gas at Nottingham.**—An inquiry was made, at the meeting of the Nottingham City Council yesterday week, as to whether it was true that the price of gas had been raised from 2s. 6d. to 2s. 10d. without notice to the consumers. Alderman Ford replied that this was so. The Gas Committee were very reluctant to advance the price of gas; but in consequence of the very high price of coal and other materials, they were compelled to do so. Otherwise for 1901 they would have had to add 8d. to the district rate. As they had a great number of consumers outside the city whom they could not charge the differential rate, they thought it advisable to advance the price of gas. The explanation appeared to give satisfaction. A correspondent in a local paper writes: "The small consumers of gas will get a great deal the best of the bargain by the raising of the price 4d. per 1000 cubic feet, instead of increasing the rates by 8d. I have a gas-cooker, and my gas bill comes to about £7 a year. I am rated at £16. Through the increase in the price of gas, I am called upon to pay 56 fourpences. If the rate had been increased, I should have had to pay only 16 eightpences—excess difference 8s. (18s. 8d.—10s. 8d.). I suppose I can have a penny-in-the-slot meter, however." This letter suggested the reflection to a note writer in the same paper "that the automatic gas measurer will give the consumer an advantage of a farthing on every twopence. There were, not so long since, about 2000 prepayment meters in the city. Probably there are more now. At a pennyworth of gas a day for each meter, this would mean a loss of £375 a year."

# PARLIAMENTARY INTELLIGENCE.

## Gleanings from the Committee Rooms.

In Committee Room No. 13, the greatest struggle of modern times in connection with gas legislation commenced last Tuesday. Big Ben had barely finished striking eleven, when the Committee Clerk announced the measure for consideration, the names of the promoters and opponents, and the Counsel engaged. The Bill was the first of the London group—that introduced by the London County Council for the purpose "of making provision as to the testing of the illuminating power of the gas" supplied by the Gaslight and Coke, the Commercial, and South Metropolitan Gas Companies, and to regulate "the supply by those Companies of prepayment meters, and fittings in connection therewith." The Committee to whom had been consigned the task of considering this and the other London Bills is composed of Mr. Oldroyd, as Chairman, and Mr. Stanley Leighton, Mr. Emmott, and Mr. Nicol. The last-named gentleman comes to the work well instructed concerning the gas supply of the Metropolis, he having been a member of the Select Committee who sat last year to inquire into the powers of charge of the London Companies. His knowledge should be very valuable—it has already been helpful—to the present Committee in the work they have in hand. The other members, so far as we are aware, have had little or no experience in connection with gas legislation; but on Tuesday they quickly disclosed their ability to intelligently grasp the complexities of the technical subject with which they were confronted, though they, as well as the opposition, appear to be somewhat confounded by the peculiarities in the County Council's case. However, in view of the importance to the gas industry of the questions with which the Committee have to deal, it is pleasing to be able to make this complimentary recognition of their adroitness in investigation, as, though the decisions may not prove exactly what well-wishers of the gas industry would desire, there is the assurance that all that is brought before the Committee will receive due consideration.

Reverting to the opening proceedings on Tuesday, a strong line of legal talent faced the Committee to conduct the cases for and against the Bill. Of the fourteen Counsel retained, no less than eight are wearers of the silk. The County Council were represented by Mr. Worsley Taylor, Q.C., and two juniors; and the eleven remaining Counsel appeared for the opposition—the Corporation of the City of London, and the Gaslight and Coke, the South Metropolitan, and the Commercial Gas Companies. It was a strange spectacle to see these three Companies for the nonce arrayed together as allies, showing a united front to a threatened danger. But though meeting on common ground in a common cause, a cold exclusiveness appeared to be maintained throughout the sittings by the official representatives of one Company towards those of the other two. Intermingling with the officials of the parties interested, were eminent Doctors and Professors of chemistry, photometrists, and engineers, some of whom recalled to memory priceless work in the scientific advancement of the gas industry, In another room the Bradford Corporation Bill was proceeding; and many of the professional witnesses there engaged could not now and again restrain a natural curiosity to see and hear what was going on in connection with what will be a memorable measure. It is a pity that the continuity of the proceedings has been broken by circumstances which no one concerned in the Bill could control. The protracted sittings on the Lea Conservancy Bill, it will be remembered, were in the first place responsible for delay; and the discussion of clauses in connection with the same measure caused a gap the whole of Wednesday. Thursday was a short sitting, presumably on account of important business engaging attention in the House. Then on Friday the proceedings came to a close, with the promoter's case still unfinished, for the Easter recess; the Chairman announcing that the consideration of the measure would be resumed on the 1st of May.

The opening speech of Mr. Worsley Taylor occupied about one-and-a-half hours on Tuesday morning; and Mr. Dibdin's evidence was spread over the remainder of the sitting. Wednesday, as already stated, was a blank so far as the Bill was concerned. On Thursday, on the request of the Chairman, Mr. A. G. Vernon Harcourt, one of the Gas Referees, presented himself for examination; and Dr. Frank Clowes, the Chief Chemist and Superintending Gas Examiner to the London County Council, was the only other witness. On Friday more progress was made—the evidence being taken of Mr. Otto Hehner, Mr. B. H. Gerrans (one of the Council's Gas Examiners), Dr. Percy Frankland, and Mr. Isaac Carr. The promoters have additional evidence to tender when the proceedings are resumed; but it is not expected that it will require any great length of time.

Of course, the most serious and controversial part of the Bill is that relating to the testing of gas, and the proposed legalization of the portable photometer. This, on the suggestion of Mr. Worsley Taylor, it was decided to discuss first, leaving the portion referring to the application of regulations to the supply of prepayment meters and fittings to be taken up at a later stage. Dealing then with the testing part of the Bill, the case of the promoters is this: That the present method of testing gas in the Metropolis is inefficient and unsatisfactory; that it was the intention of the Legislature that at any point at which it is reasonable to make a test, there should be found gas of 16-candle power; that unfortunately this intention is not under existing conditions secured; that fortunately for the consumers the County Council are alive to this fact, and intend to remedy it, if possible, by the present Bill, so that the consumers may know that what they pay for they get. The instrument by which this is to be ensured is that variously known by the appellations "portable," "peripatetic," "perambulating," and "detective" photometer. That there is any intention on the part of the promoters to act unfairly to the Gas Companies, or to put any new burden upon them is disclaimed—in fact, one was inclined to feel, in listening to the Counsel opening the case, that it was only an earnest desire on the part of the Authority at Spring Gardens to keep the Gas Companies from straying from the path of rectitude in the future (as, we are asked to believe, on the evidence of a wandering photometer, whose virtue is doubtful, they have done in the past) that had brought about the promotion of the Bill. The supposition that it is intended to test the gas in back streets and on dead-ended mains it appears is quite unfounded; it is, indeed, an unworthy act to even think that such an idea has ever crossed the minds of the guileless County Council. Under the Bill, it would have been quite possible to make such tests; but Mr. Worsley Taylor has since committed himself to insert a clause, if desired, to the effect that testings shall not be made in a place evidently improper. But such a clause would have to be very specific, or there would be endless trouble. To impress upon the Committee that such unwarrantable motives as those imputed to the Council were far from their thoughts, it was frequently pointed out that it was intended that the testing by portable photometers should be under the control of the Gas Referees; but no one explained why, if portable photometers were the one thing required for the protection of the gas consumers, the Referees had left it to the London County Council to take the initiative in suggesting their introduction. However, Mr. W. J. Dibdin, who will be remembered as the former Chemist and Superintending Gas Examiner to the County Council, and the father of the portable photometer proposal, assured the Committee that it had met the Referees' approval. Some time ago, he submitted one to them; and he states that he was informed that "they considered it a proper and correct instrument, and such as they would certify for testing in the way proposed." In cross-examination, too, he emphatically declared that the Referees had "over and over again" suggested that this should be done. But no letter or document vouching for the accuracy of Mr. Dibdin's memory was put in; and he could not refer to a single print where the Referees had found fault with the present system of testing.

Now let us see from the evidence how this portable photometer idea has been worked up. Mr. Dibdin became the Superintending Gas Examiner in 1882; and two years later he commenced testing with the portable photometer. He says that this method of testing suggested itself to him in consequence of complaints as to the quality of gas, and an instruction to investigate the matter. Later in his evidence, we see that the portable photometer showed there was no justification for the complaints; for at the outset he obtained a return by it of 16·4 candles. But this result did not satisfy Mr. Dibdin; and he continued the peripatetic testing. With the development of the idea, there came about a deterioration in the quality of the gas—according to the portable photometer. But the official tests were at the time fairly constant, and up to the standard. Further on, Mr. Dibdin says that comparative tests made in a properly fitted testing-station with a portable and a fixed instrument gave concordant results—as near in fact as 0·1 candle; and yet, when the portable photometer was taken to a building a few yards distant, there was a serious deficiency in illuminating power. A still more startling assertion of Mr. Dibdin's is that between a testing-station at which uniform results were obtained with both instruments and the works supplying the gas—*between* those two points be it noted—he had found a deficiency of as much as 4 candles. How this happens, Mr. Dibdin does not attempt to explain; but he will not admit that the difference in the conditions surrounding the tests had anything to do with the matter. Most of his tests were made in school-rooms, fire-brigade stations, and other public institutions where the conditions which are generally accepted as requisite for accurate testing can hardly be expected to prevail. But Mr. Dibdin scoffs at the notion that those conditions are necessary to exact testing; and he characterizes them as "coddling." But if the dissimilar conditions are not responsible for the wondrous results laid before the Committee, then what is? The whole thing is too mysterious for Mr. Dibdin to explain; but most men will have little difficulty in coming to a decision on the subject. Liverpool was cited as a place where there has been experience with the portable photometer; and this raises another inexplicable point. The promoters admitted that in Liverpool the tests by the instruments showed a remarkable consonance with those made by a fixed photometer. Then why did they not do so in London? Another remarkable assertion by Mr. Dibdin was that the Gas Companies were responsible for the introduction of all the gas-testing "paraphernalia," and not the Gas Referees. It may also interest some readers to learn that Mr. Dibdin's opinion is that it would be more economical for the London consumer to have gas of higher illuminating value than they have now at an extra cost of 4d.; but men of equal and higher eminence than Mr. Dibdin think otherwise. Counsel, in cross-examining Mr. Dibdin, had difficulty at times in getting direct answers to some of the questions.

The evidence of Mr. Vernon Harcourt must, of course, be taken as coming from an independent witness. He was of opinion that consumers throughout a district were entitled to the standard quality of gas; and he considered that a test made with a portable photometer, *if rightly used*, would be a fair one. But if such photometers were adopted, there should be limitations. Many of his other statements were also accompanied by qualifications. Dr. Frank Clowes put in a large number of tests, showing some curious defections in illuminating power, detected by both roving and fixed photometers. But outside those tests he could not be induced to depart; nor would he express any opinion as to why the official tests gave higher values. In his opinion, however, the fixed testing-station did not ensure that the consumers got 16-candle gas. Mr. Otto Hehner confessed that, when he formerly tested as an official examiner, he found a remarkable concordance in the results; and Mr. Gerrans stated that the general average of his official tests over five years (excepting on three or four occasions) had not fallen below 16 candles. But some of the special tests that Mr. Hehner had made for the purpose of supporting the Bill showed remarkable and rapid changes in illuminating power. In one instance, at the Blackfriars Road testing-station, he got the low result of 11·3 candles, and in about two hours there was an ascent to 17·3 candles. It is extraordinary that a strange occurrence of this kind should have happened at this critical time for Mr. Hehner's edification. The tests quoted by Mr. Gerrans did not show any remarkable divergencies. In the judgment of Dr. Percy Frankland, the portable photometer is a trustworthy instrument. Some interesting experiments were also described by him; and his evidence indicated that his opinion was that, by use of enrichment processes, the illuminating power of gas could be quickly raised and varied, and that this might account for some of the discordant results. The most pertinent part of Mr. Isaac Carr's evidence showed that he shared similar views. This was the nearest approach to anything like a reason for the abnormally wide differences in illuminating power found by means of the portable photometer. The Council were too wise to impute fraud on the part of the Companies, or manipulation of the supply to the testing-stations; but, after hearing the evidence, one has a feeling that some of the witnesses are not altogether sure there is not

a little "diddling" going on somewhere. If one of the effects of portable photometers is to produce disordered imaginations, then the sooner their use is discontinued the better.

The line which the opponents will take against the Bill is indicated in their petitions. They are, among other points, apprehensive that the Bill will increase the price of gas to the consumers; that the substitution of a rough and less accurate instrument will fail to find the full illuminating power of the gas tested; that it is absolutely necessary the tests should be safeguarded by the conditions obtaining in the testing-stations, and prescribed by the Referees; that, if the Bill is passed, increased enrichment of the gas will be necessitated; and that, in these days of improved burners, and heating and cooking by gas, the use of gas of high illuminating power is wasteful. Mr. Worsley Taylor's laconic comment on some of these points was "I cannot help that," which hardly squares with an earlier boast that it was not the County Council's desire to inflict any additional burden on the Gas Companies. More will be heard from the opponents after the Easter vacation.

The gigantic scheme of gas-works absorption contained in the General Powers Bill of the Bradford Corporation looks as though it is going through; and it is pretty safe to predict that, within a few years, the Yorkshire section of the returns relating to gas undertakings other than those of Local Authorities will, in consequence, be shortened by the omission of the statistics of at least half-a-dozen concerns. This proposed wholesale annexation of gas undertakings has come about by the extension of the boundaries of Bradford, and in fulfilment of a promise by the Corporation just prior to that event that steps should be taken to secure equality of gas prices throughout the entire area. Last year the Corporation commenced operations by trying to obtain parliamentary powers to buy up the portions of the Pudsey and Shipley Companies within the city boundaries; but dismemberment of this kind was obviously unjust to the Companies, and Parliament would not hear of it. For the present, those Companies remain undisturbed; but what has happened in the last few days foreshadows their dissolution within a few years. In regard to the other Companies supplying gas in the limits of the city, the Corporation this session included in their General Powers Bill more reasonable proposals than those which they put forward in connection with Pudsey and Shipley. They asked for power to acquire the Clayton, Allerton, and Thornton Company, the North Bierley Company, the Eccleshill and Bolton Company, and the Airedale Company; and to purchase gas in bulk from the Drighlington and Gillersome Gas Company. Provision was also made for the re-sale to the Local Authorities concerned of the extra-mural portions of the undertakings if desired. The price of gas in the part of the city supplied from the Bradford works is 2s. 1d. per 1000 cubic feet; and the Companies supplying within the extended parts charge from 5d. to 1s. more. But with the levelling down of the price of gas in one district—North Bierley—there will be a levelling up of the rates to the extent, we believe, of 1s. 4d. in the pound; so that the reduction of price there will be a doubtful blessing to the ratepayers. The Bill was before the Police and Sanitary Regulations Committee of the House of Commons, presided over by Lord E. Fitzmaurice, from Wednesday to Friday last. No allegations were made by the promoters as to any deficiencies in the supply by the Companies, and it was very fairly admitted that, considering the character of the Companies' districts and the moderate consumption, the prices charged were not excessive. The whole case, in fact, was based on the desirability of a gas-works-owning municipality having the gas supply of their entire area in their own hands, in order to secure uniformity of charge and absolute control of the streets, &c. The Companies all appeared in opposition; but it was the opinion of the Corporation Gas Engineer (Mr. Charles Wood) that they were only there to secure better terms of purchase, and would, in fact, be much disappointed if the Bill did not pass. But the legal and expert force which the Companies had present hardly supported the latter part of that view. On the other hand, references to correspondence which had passed seemed to indicate that the Companies were not altogether unwilling to sell if what they considered adequate terms were offered; but nothing acceptable had been arrived at. The question of compulsory purchase, of course, bulked largely in the discussion; and in this instance, as in numerous previous cases, the promoters were embarrassed by not being able to produce a single precedent for the compulsory purchase of gas-works which has been fought through both Houses. The case for the gas section of the Bill was completed just before the adjournment on Friday; and the Committee then had a private consultation. This resulted in an announcement by the Chairman, that he and his colleagues could not help thinking that the parties might come to terms of agreement; and they had therefore decided to reserve the further consideration of this part of the Bill until after the Easter holidays. Previous to this, however, a bargain between the promoters and the North Bierley Company had been struck for purchase by a lump sum; and after the expression by his Lordship of the views of the Committee, a close conference was observed to be going on between the experts of the other parties. There is, we are informed, every probability of a speedy conclusion of terms in their cases also. It is understood that the North Bierley Company have come down a little in their original ideas as to the terms on which transfer should take place; but it is said that they could hardly have hoped to obtain a larger sum than they have secured if they had gone to arbitration, and, of course, in this direction, heavy expense has been saved. A report of the evidence laid before the Committee will be published next week; but, in the meantime, it may be stated that among the witnesses called to support the promoters' case were Mr. Charles Wood, Mr. Corbet Woodall, Mr. E. H. Stevenson, Mr. W. A. M'Intosh Valon, and Mr. Charles Hunt. The Engineers retained on the opposition side were Mr. T. Newbigging, Mr. H. E. Jones, Sir F. Bramwell, Mr. R. Porter, and Mr. T. Bower.

The petition of the Wolverhampton Corporation against the Gas Company's Bill has been withdrawn; the parties having agreed upon the insertion of a clause under which the Corporation may, if they so desire, apply in a future session for powers of purchase. It is suggested that they may do so next year; but a recent resolution on the question rather points to the conclusion that the Corporation are not of one mind as to the advisability of acquiring the concern. The insertion of a purchase clause in the present Bill, however, looks as though there is to be a reconsideration of the matter. It is understood that Mr. Corbet Woodall has been advising the Company in connection with their Bill; and Mr. W. A. Valon was consulted by the Corporation.

Our readers are aware that the Dorking Water Company have promoted a Bill to enable them to raise further capital, to the extent of £16,000 by shares and £4000 by loan, and construct additional works; and the Local Authorities sought to have a clause inserted giving them power to purchase the undertaking within ten years. This proposal was strongly resisted by the Directors of the Company, and the District Council accordingly presented a petition against the Bill, which recently came before the Committee of the House of Lords. Although the terms of the clause which their Lordships sanctioned give the Urban and Rural District Councils, or either of them, the privilege they desire, the period in which it may be exercised has been restricted to two years. On the other hand, the Water Company are limited to an expenditure of £5000 of additional capital; while the clause further stipulates that the Company shall, on the passing of their Bill, pay one-half of the costs of the petition.

## HOUSE OF LORDS.

The following further progress was made with Private Bills last week:—

Bills brought from the Commons, read the first time, and referred to the Examiners: North Warwickshire Water Bill, Southport Water Bill, Spalding Urban District Council (Water) Bill.

Bills read a second time and committed: Grantham Gas Bill, Hartlepool Gas and Water Bill, Redhill Gas Bill.

Bills reported, with amendments: Dorking Water Bill, Exmouth Urban District Water Bill, Fishguard Water and Gas Bill, Glyncorrwg Urban District Council Gas Bill, Hemel Hempstead Corporation (Water) Bill, Kingston-upon-Thames Gas Bill, Mountain Ash Water Bill, Rugeley Gas Bill.

Bills read the third time and passed: Cleethorpes Gas Bill, East Stirlingshire Water Bill, Falkirk and District Water Bill, Great Berkhampstead Water Bill, Kingston-upon-Thames Gas Bill, Mountain Ash Water Bill, Newtown and Llanllwchaiarn Urban District Gas Bill, Paignton Urban District Water Bill.

The South Essex Water Board Bill and the South Essex Water Bill were referred to a Select Committee, consisting of the Earl of Lauderdale (Chairman), Earl Carnwath, Lord Barnard, Lord Sudley, and Lord Farquhar; to meet on Wednesday, May 2.

The Rotherham Corporation Bill was referred to a Select Committee, consisting of the Earl of Jersey (Chairman), the Earl of Yarborough, Lord Lawrence, Lord Northbourne, and Lord Ludlow; to meet on Wednesday, May 2.

The Walsall Corporation Bill has been referred to the Select Committee on the North-Eastern Railway and other Bills.

The Morecambe Gas Company have petitioned against alterations in the Morecambe Urban District Council (Gas) Bill.

## HOUSE OF COMMONS.

The following further progress was made with Private Bills last week:—

Bill read the first time, and ordered for second reading: Portland Urban District Gas Bill (to empower the Council to acquire the undertaking of the Portland Gas Company, Limited).

Lords Bills read the first time and referred to the Examiners: Cleethorpes Gas Bill, East Stirlingshire Water Bill, Falkirk and District Water Bill, Great Berkhampstead Water Bill, Motherwell Water Bill, Newtown and Llanllwchaiarn Urban District Gas Bill, Paignton Urban District Water Bill.

Bills read a second time and committed: Higham Ferrers Water Bill, Menstone Water (Transfer) Bill, Otley Urban District Council Water Bill.

Bill reported with amendments: Maidenhead Gas Bill.

Bills read the third time and passed: North Warwickshire Water Bill, Southport Water Bill, Spalding Urban District Council (Water) Bill.

The Shoeburyness Urban District Council have appiled for leave to deposit a petition for a Gas Bill.

**Monte Video Water-Works Company, Limited.**—At the ordinary half-yearly general meeting of this Company on Monday last week, the report of the Directors, which was noticed in the "JOURNAL" for the 27th ult., was adopted, and a further dividend of 2½ per cent. (making 5 per cent. for the year) declared.

**Failure of the Teignmouth Gas Supply.**—Teignmouth was practically without a supply of gas on the night of Friday, the 30th ult. At a meeting of the District Council last Tuesday, the Gas Manager explained that he was turning the gas into the new holder, and instead of driving out the air through the crown he drove it into the main, hoping that the gas and the comparatively small quantity of air would mix and burn. The result was that it was practically impossible to get a light. The gas ought not to have been turned into the holder until Sunday morning, when all the trouble would have been avoided.

**The Halifax Corporation and their Water Reservoirs Contract.**—At the meeting of the Halifax Town Council last Wednesday, a resolution passed by the Water Committee, to the effect that tenders be invited for the execution of the works in connection with the construction of three reservoirs at Walshaw Dean, came up for confirmation. Mr. J. Parker moved that the minute be referred back, with a view to the Corporation carrying out the work themselves. He said that by constructing their water-works under their own supervision, the Corporation would be able to do the work better than it could be done by contract. The scheme was to involve an estimated expenditure of from £150,000 to £160,000. Mr. J. Wade, the Chairman of the Water Committee, said that if the Corporation undertook the construction of the works they would have to purchase plant which it was estimated would cost from £15,000 to £20,000; and when the reservoirs were finished, they would most likely not get more than half this price for it. The work could be quite well carried out by contract, for there would then be effective supervision. Mr. Parker's proposal was defeated, and the minutes were confirmed.

## HOUSE OF COMMONS COMMITTEE.

### Tuesday, April 3.

(*Before Mr.* OLDROYD, *Chairman, Mr.* EMMOTT, *Mr.* NICOL, *and Mr.* STANLEY LEIGHTON.)

### THE GASLIGHT AND COKE, COMMERCIAL GAS, AND SOUTH METROPOLITAN GAS COMPANIES BILL.

This Bill, which is promoted by the London County Council to make further provision with regard to testing the illuminating power of the gas supplied in the Metropolis, and to confer power on the Board of Trade to regulate the charge for, and the supply of prepayment meters and fittings, came to-day before a Select Committee constituted as above.

Mr. WORSLEY TAYLOR, Q.C., Mr. TALBOT, and Mr. B. WILKINSON appeared for the County Council. The other Counsel engaged were: Mr. LITTLER, Q.C., and Mr. H. A. RIGG, for the Corporation of the City of London; Mr. POPE, Q.C., Mr. CLAUDE BAGGALLAY, Q.C., Mr. DANCKWERTS, Q.C., and Mr. R. J. NEVILLE, for the Gaslight and Coke Company; Mr. LITTLER, Q.C., Mr. BAGGALLAY, Q.C., and Mr. SNAGGE, for the Commercial Gas Company; and Mr. BALFOUR BROWNE, Q.C., Lord ROBERT CECIL, Q.C., and Mr. L. W. S. ROSTRON, for the South Metropolitan Gas Company.

Mr. WORSLEY TAYLOR said that the Bill was "for making further provision as to testing the illuminating power of gas supplied by the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies in the Administrative County of London." This was one part of the measure; but another object was "and for regulating the supply by those Companies of prepayment meters and fittings in connection therewith." He thought his learned friends who appeared for the Gas Companies would agree with him that the most convenient thing for everybody would be to deal with the first part of the Bill at once, and leave the penny-in-the-slot matter, because the Bill of the South Metropolitan Gas Company, to be dealt with later, bore upon this subject; and it would be well that the two proposals should be considered together. He would therefore only deal with the illuminating power of the gas.

Mr. POPE objected to the South Metropolitan Gas Bill being dealt with out of its order on the list.

Lord R. CECIL also objected.

The CHAIRMAN said there seemed to be some difficulty in regard to the South Metropolitan Gas Bill. Was it suggested that that Bill could not be taken at present?

Mr. WORSLEY TAYLOR said he was of opinion, and Mr. Pope agreed with him on the main point, that the second part of the Bill should be dealt with separately. Assuming that the first part was disposed of, the Committee would then proceed to consider the second part; and all the three Companies would have to be heard. Then would come on the Bill of the South Metropolitan Company, which would not be reached before Friday. He doubted whether the Committee would have disposed of the first part of the present Bill before Friday.

The CHAIRMAN said that one of the members of the Committee was interested in another Committee, and wished to take an active part in connection with its business. He could not enter upon the consideration of any Bill which they had not a prospect of finishing before Easter.

Mr. WORSLEY TAYLOR said that the slot meter part of the Bill would affect all three Gas Companies. All of them were opposing it; and one of them had a competing Bill on the subject. Therefore the Committee would have to deal with three oppositions to the County Council Bill, and one other substantive Bill. If the Committee said that one member of their body could not sit after Easter, it disposed of the possibility of dealing with the subject involved before Easter. He did not know what would be the position under the circumstances. The Bill was an omnibus one; and the two parts he referred to were separate. He did not know what the practice of the House of Commons was when a question arose as to different Committees dealing with different parts of the same Bill.

The CHAIRMAN said the Committee had the clauses of the Lea Conservancy Bill to consider; and he did not suppose that the present Bill would be dealt with in the time which would remain that week. It would be better to postpone the Gas Bills until after Easter.

Mr. WORSLEY TAYLOR said that the Committee would have to deal with exceedingly technical matters; and it was impossible to say what subjects might not crop up in the course of the discussion which would have a bearing on the Bills that were to follow. One of the members of the Committee (Mr. Nicol) had had experience in connection with these gas questions; and he would support the view that it was desirable that one and the same Committee should deal with all the Bills.

Mr. NICOL remarked that, having regard to his experience last session, he anticipated that there would be considerable discussion on these Bills; and he failed to see how one could be separated from the others.

Mr. WORSLEY TAYLOR said that might well be the case. The Bills were really separate. The discussion on each might be disposed of separately; but, at the same time, he was not prepared to say that matters would not arise on one Bill which would throw light on another. It was desirable that they should have the same Committee throughout the inquiry.

Mr. POPE said the only other question was that there were a number of very important inquiries which had been fixed to be taken immediately after Easter, in which most of the Counsel would be heavily engaged. He did not think the testing question would be long; and the Committee might reasonably dispose of it before Easter. But then there was the difficulty of substituting a new member of the Committee.

Mr. WORSLEY TAYLOR said that was his point.

Mr. NICOL remarked that in all probability there would only be that day and one other before Easter for the consideration of the Bill.

Mr. WORSLEY TAYLOR thought that was very likely.

Lord R. CECIL said he was instructed to say, for the South Metropolitan Company, that it was extremely desirable the same Committee should hear the County Council Bill and the South Metropolitan Bill.

The CHAIRMAN (after consultation with his colleagues) then said: It seems we have got over the difficulty with regard to the change of *personnel* of the Committee; and therefore I think we may go on.

Mr. WORSLEY TAYLOR then proceeded to open the Bill. He said in 1875 there were nine Companies supplying gas in London, each having its own separate Act in which there were various conditions and various charges; the result being that there was serious discontent among the consumers. The Metropolitan Board of Works therefore, in 1875, promoted three Bills dealing with the districts of the Companies; and though these Bills did not pass, there was a discussion on them which led to amalgamations until the Companies were reduced to three. Then the sliding-scale and certain other regulations—notably those dealing with the question of the illuminating power—were introduced. Previous to 1875, the illuminating power of the gas varied; but by the legislation of 1875 and 1876, it was fixed at the uniform figure of 16 candles—the prices chargeable being fixed on this basis. Having to pay for 16-candle power gas, regulations were put in the Bill to secure that to the consumers. He read sections 26 and 28 of the South Metropolitan Act of 1876, to show the manner in which the gas was to be tested—there being similar provisions in the Acts of the other Companies. The Gas Referees, he pointed out, were gentlemen appointed by the Board of Trade, and were therefore independent arbiters between the consumers and the Companies. Section 26 said the gas to be supplied (clearly to the consumer) was to be of 16-candle power when tested by a certain burner; and by section 28 the Gas Referees were to have the power to prescribe from time to time the mode of testing. He called particular attention to section 35, under which the Referees might prescribe and certify the situation and the number of the testing-places, and the apparatus and materials therein for testing the illuminating power. The Referees were, therefore, given the widest power to appoint from time to time such number of testing-places as in their sole judgment they deemed to be necessary as between the consumers and the Companies; to say at what points they were to be placed; and to prescribe the mode of testing the gas—provided always that the specified description of burner (viz., a Sugg argand) was used. Counsel went on to quote at length the various provisions of the General Act of 1880, which applied to all the Companies. The testing-places were to be provided by the Companies; and the Act gave power to the Referees to examine them to see that the apparatus was in working order. By section 14, it became clear that it was the intention of Parliament that at every point in any district where it was reasonable to make a test, there should be found 16-candle power gas. No one he thought would dispute this obligation. But unfortunately the intention had not been carried out, and it was not secured by the Act; and it was to remedy this grievance, which was very serious for consumers, that the present Bill was brought in. Mr. Dibdin, who was very well known in his profession, was Chief Gas Examiner to the Metropolitan Board of Works, and subsequently to the London County Council, from 1884 to 1897, and in that time he made a series of tests. The same course was followed by Dr. Clowes, who succeeded him; both being careful to make the tests at fair points, because fallacious and unfair results would be obtained if the gas tested had stood for some time in the pipe or at a dead-end, or even if it were taken from a small service-pipe. They therefore tested at places where there was a large consumption—such as board schools and fire-stations. In 1896, Mr. Dibdin found that, instead of the gas being of the average of 16-candle power, it was only 15·1 candles—practically 1 candle less than it should have been. Dr. Clowes made experiments in his own way, in places selected to the best of his judgment, and quite independent of Mr. Dibdin; and the results bore out those of that gentleman. He found that the gas under 16-candle power amounted to about 82 per cent. of the total quantity supplied to London. In 1893, Mr. Dibdin found the average of the South Metropolitan Company was even lower than 15·1 candles—viz., 14·3 candles—and in certain other cases (where, however, Counsel agreed the circumstances were not such as would give fair results), the quality got down to between 11 and 12 candles. But suppose the quality was 15·1 candles, they would see what this would mean when they recollected how large the consumption of gas in London was, and that the Gas Companies themselves reckoned a difference of 1-candle power meant to them 1d. per 1000 cubic feet. As a fact, the County Council put the equivalent of the difference at nearer 5d., which, if it were at all approaching the fact, would mean an enormous loss to the consumer, not only directly, but indirectly, because if, instead of 16-candle gas, gas of 15, 14, or 13 candles were burnt, being less dense, more gas would rush through the burner which would be used for 16-candle gas; and therefore double loss would follow. The people were entitled to 16-candle gas. They did not get it; and the present Act did not give them the means of knowing whether they obtained it. The Council said they ought to have it, and to have the means of knowing they had it. They did not, however, seek to increase the obligations of the Companies, but merely to obtain facilities to see that they carried out existing obligations. How it was the people did not get 16-candle gas, was a mystery he could not fathom. They could go to the official testing-place, and, as a result of independent testing, find the gas was of 16-candle power; but if they went to houses between that same testing-place and the works, they would not get it of as high power. He had inquired how this was; but the answer he received was: "I cannot tell you." One could only conjecture. Not merely, however, at the testing-places, but in the houses also ought they to get gas of 16-candle power. The object of the Bill was to secure, by means of reasonable tests at reasonable places, that the consumer should get at his burner 16-candle gas. At present, the test was made at a certain fixed place with a fixed photometer; but that test was absolutely fallacious. It might be asked why the Council did not go to the Gas Referees and ask them (say) to require the Companies to put a testing-station in the remoter parts of the district. The answer was that while there was power to require, which meant to request, there was no power to compel. There was power to prescribe; but the Companies were not obliged to take the prescription, because there was no penalty. There were testing-places now, but they were useless. Who knew where the gas came from? There might be several mains passing the testing-station door, with different qualities of gas in each. What good was it to the consumer to know that from one main there came 16-candle gas, when from the same supply within ten yards of the station where this result was obtained there came gas of 15, 14, or 13 candle power. The Act had failed; there had been grievous loss to the consumer which ought to be remedied; and the only question was whether the proposal of the Bill was fair. The Council thought there was a way of ensuring the supply everywhere of 16-candle gas, by means of the portable photometer, which was an apparatus of the same kind as the ordinary photometer, except that it could be

carried about and fixed to a gas-pipe anywhere. Mr. Dibdin had taken every precaution to secure a just and perfect instrument for testing; and the one he had produced was said by Messrs. Sugg and by the Gas Referees to be fair. The instrument had been tried in Liverpool; and there the results obtained from it showed considerable discrepancy, as compared with the tests made at the fixed testing-places. The Company objected at first, but finding that it gave accurate results agreed to it; and it was now in general use there—the result being that gas of the proper quality was supplied all over Liverpool, and both the Company and the public were satisfied. Clause 3 of the Bill provided—

Any gas examiner may at any time make, at any place within the district supplied by any of the Companies, tests for ascertaining whether the illuminating power of the gas supplied by such Company at such place is that required by law. The apparatus to be employed in such tests, and the mode of conducting such tests and recording the results thereof, shall be from time to time prescribed by the Gas Referees: and the Gas Referees shall from time to time make regulations with respect to those matters, and shall send to the Council, the Corporation, and each of the Companies a copy of such regulations.

What the Council proposed to use was the portable photometer—that being to their mind a fair and just instrument. But the portable photometer was not prescribed by the Bill; the apparatus and mode being left in the hands of the Gas Referees, who were an independent body. Then section 4 of the Bill said—

Sections 11, 12, 13, 14, 17, 18, 19, and 20 of the Act of 1880 shall, so far as they are applicable and with the necessary modifications, apply to the tests by this Act authorized; the expression "testing-place" in the said sections being taken for the purposes of such application to refer to any place at which a test by this Act authorized is made.

This brought in all the machinery and penalties of the previous Acts. It was complained by one of the petitioners that section 8 of the previous Act had not been incorporated, which said the average of the tests, and not an individual test, was to be taken. He agreed that it would not be just to take an isolated case; and if the clause did not cover the point, the promoters would insert the necessary provision. Clause 5 said—

At least 24 hours before any test is made under this Act, the Council or the Corporation, as the case may be, shall give to the Company interested notice that tests are about to be made under this Act; specifying in such notice one of the testing-places prescribed and certified by the Gas Referees, and the hour at which it is proposed to start from such testing-place in order to make tests under this Act. No person shall disclose to such Company by such notice or otherwise the place at which any such tests are to be made. Any officer of such Company who may attend at the time and place specified in such notice, shall be entitled to be present at the making of such tests, but shall not interfere therein. Any notice under this section may be sent by post.

This carried out the principle embodied in all Acts of this nature dealing with the relations between Gas Companies and the public, and enabled a surprise visit to be paid. There was clearly no hardship, because the Companies were bound to supply continuously 16-candle power gas. The Bill was a fair one. It simply enabled the County Council to go before a body of experts appointed by Parliament, and give that body an opportunity, if they were satisfied that the existing means were not a proper security for the due carrying out of the Companies' obligations, of prescribing fair and just means. If the present means were fair, the County Council would be content to be bound by a decision of the experts to that effect. Why were not the Companies? He was curious to know what their answer would be. Turning to the petitions, he said the first was that of the City Corporation, who said they were at present the sole authority for gas-testing in the City, and that the concurrent jurisdiction proposed in the City was unnecessary and uncalled for, and ought not to be sanctioned; and further they were apprehensive that the proposals of the Bill might increase the price of gas in the City. That, however, was clearly impossible. Then they objected to the giving of 24 hours' notice of the intent to test, on the ground that it would tend to nullify any useful results that might be anticipated from the tests proposed. Although the City therefore differed from the County Council as to who was to be the authority in the City, they thought the Bill ought to be strengthened. He did not think, however, they quite understood the proposal in this respect. The next petition was that of the Commercial Gas Company, who said: "Your petitioners have spent large sums of money in equipping proper testing-places, selected by the Gas Referees, with the delicate and accurate instruments prescribed by them, and under the existing system have always met their parliamentary obligations. The substitution of the rough and less accurate instruments suggested by the Bill would fail to find the full illuminating power of the gas, and so would work injustice. Moreover, the taking of tests in any places selected by the County Council would be unfair, because it would be impossible to maintain the conditions of temperature, ventilation, and freedom from cross lights which are secured in the existing testing-places under the prescriptions of the Gas Referees." He would quite agree with that if the Bill asked the Committee to stereotype an instrument, or gave to the County Council power to prescribe any instrument they liked. But both these matters were to be in the hands of the Gas Referees. Then they talked about "the vagaries of an uncertain test taken by an unreliable instrument under improper conditions." But could they believe the Gas Referees would allow a test to be taken in that way? Further, they complained that "the Bill constitutes a vexatious breach of the conditions as to testing laid down by Parliament." Well, Parliament would remedy an injustice, even if carried out under an Act. They went on: "These conditions were prescribed after careful inquiry into the whole subject; and your petitioners, in common with other London Gas Companies, have every right to regard that Act as a settlement of a very important and delicate point going to the very root of a Gas Company's business, and one that should only be disturbed on the strongest evidence of its imperative necessity." He agreed that, unless the Committee were satisfied that there was strong public necessity to make the change, they should not do it. If he did not prove the necessity, the Bill would fail. They referred to "careful inquiry." This was the best Parliament could do at that date; but they had not the experience of the twenty years which had elapsed, in which great changes in the gas world had taken place. The petition went on to state that "the general use of improved burners which greatly increases the illuminating power obtainable from gas makes the quality of the gas anywhere else than at the burner a matter of secondary importance." That the consumer only cared what the gas was at the burner, he agreed; but he was at issue if they meant to say that they could supply gas of 13 or 14 candle power which would appear better in a burner which had been purchased at increased cost, because they were bound to supply gas of 16-candle power. Then they said the competition of electric light (which was not tested at all) was a great protection to those requiring light in the district. The logical conclusion from that was that all tests were unnecessary and should be abolished. The 20th paragraph commenced: "A very large proportion, and an increasing one, of the total quantity of gas consumed within your petitioners' district, is used for the purposes of heating and cooking and power, for which purposes the use of gas of high illuminating power is wasteful." This seemed to go very far towards admitting the case for the Bill; just as though the petitioners had said that, though they were bound to supply 16-candle gas, they did not consider it necessary for heating or cooking purposes, and as the illumination did not depend on the gas so much as the burner, they went on supplying 14-candle gas. The petitioners said, in the latter part of paragraph 20: "If, however, your petitioners are to be put under the new conditions proposed by the Bill, your petitioners may be compelled to enrich their gas by the employment of petroleum spirit, or by other means. This must necessarily increase the cost of the gas; and an increase in the price charged will be inevitable." Well, if they should have to enrich their gas, he really could not help that. If they were bound to enrich it, they must do so. The consumer had nothing to do with the matter. And as to their "necessarily increasing the price of gas," he could not help that. The petition then proceeded: "(21) Your petitioners respectfully submit that this would be a hardship to poor consumers. Gas is so extensively used in your petitioners' district for cooking and heating purposes, that the use of coal for these purposes has been largely discontinued. There is a great advantage, therefore, to the poorer classes in your petitioners' district in having at hand a fuel at a fixed low rate of charge, as compared with the fluctuating and arbitrary price of coal. (22) As an increase in the cost of gas of 1d. per 1000 cubic feet is equal to £10,500 per annum, and it would only cause the shareholder a loss of ¼ per cent. dividend on £784,000, or £1960, it will be seen that of the total sacrifice of £12,460, more than five-sixths fall on consumers of gas; therefore, he loses nearly the whole of any additional cost, and gains similarly nearly the whole of all savings." He failed to see what this argument meant. It seemed to be this: "If you put this charge on us, though it is necessary to carry out our original bargain, we shall have to enrich our gas, and shall be compelled to increase our charge; and the whole of the cost will fall on the consumer." If this were the effect—and he did not admit it for a moment—there would be no hardship on the Company. They seemed to him to put themselves out of court in every way. The Gaslight and Coke Company, in paragraph 7 of their petition, said: "The present system of testing the gas supplied by your petitioners was settled after a long and careful inquiry, and has from time to time been revised by the Gas Referees as occasion required, and has now for a long time worked well daily and without complaint, and affords every reasonable protection to the public against any deficiency in the illuminating power of such gas; and your petitioners respectfully submit that the Gas Referees, under the existing statutes, have ample powers for correcting any imperfection in the system of testing as occasion may require." This was just what they would not do. The petition continued: "and that no case has been made out, or can be made out, for giving the Gas Referees or Gas Examiners the additional powers proposed by the Bill, or for altering in any way the present method of testing." They went on to define the requisites for gas-testing, which would be matter of evidence. They then said: "Furthermore, your petitioners allege that it is a well-known and admitted fact among gas experts, that gas which has remained stagnant in a main or pipe for a considerable time, or which has become condensed, does not always preserve the illuminating power which it originally possessed; and they contend that, in order to obtain a fair and proper test of the illuminating power of their gas, it is essential that the same should be taken from a main or pipe in which such gas at the time of the test is freely circulating, and your petitioners submit that it would be grossly unfair and prejudicial to your petitioners to authorize, as the Bill proposes, that tests should be made of your petitioners' gas irrespective of whether the portion of gas so tested is or is not a fair sample of your petitioners' gas taken under fair conditions." Well, if the Bill proposed what the petitioners there indicated, their adjective "grossly" unfair would be justified; but it was proposed to leave this matter to an independent body.

Mr. Nicol: Under the control of the Board of Trade.

Mr. Worsley Taylor: Not under their control.

The Chairman: Appointed by them.

Mr. Worsley Taylor said the petitioners alleged that the Bill did not make provision for the average; and this was right. In paragraph 13, the petitioners drew attention to the expenditure in connection with the maintenance of the testing stations and the salaries of officials, and said that the Bill would cause an increase in these respects. The Commercial Company did not say anything of the kind. The South Metropolitan Company, in their petition, in paragraph 16, said: "The Bill is ill-conceived and illusory as regards its apprehended benefit to the consumers, because the illuminating power of gas in the main, owing to the improved burners now generally in use, is no criterion of the illuminating power of gas issuing through the consumer's burner." This was the curious argument he had already referred to—namely, that, because the consumer might buy burners that give a better result, therefore the Gas Company were to be at liberty to supply a lower quality of gas than had been bargained for. Paragraph 2 of the same clause said: "Upwards of 50 per cent. of the total quantity of gas consumed within your petitioners' district is used for purposes other than lighting—such as heating, cooking, manufacturing, and power—for which purposes the use of gas of high illuminating power is sheer waste." But that meant that, whereas they were supplying 16-candle gas, they ought to be supplying 10 or 11 candle power gas, or what they liked. If it did not mean that, he failed to see what it did mean. The remainder of the paragraph he had dealt with already. Paragraph 17 went on to say that the Bill was unjust to the petitioners, and proceeded to give the cause of that alleged injustice; but all that was a matter of evidence. In the third

paragraph of 17 they said: "Because, in order to protect themselves from the results of a possible deficiency by the proposed new test, your petitioners will have to raise the quality of gas as sent out from the works to at least 18½ candles, and even then there will be the constant risk of a possible default when tested in the manner proposed." He should not care if this allegation were true. Their obligation was to maintain 16-candle gas; and whether they had to turn out 18 or 18½ candle power mattered not a row of pins.

It having been agreed that the Committee should inspect a sample of the proposed photometer during the luncheon hour,

Mr. *W. J. Dibdin* was examined by Mr. TALBOT.

Witness said that from 1882 to 1897 he had held the position of Chemist and Superintending Gas Examiner to the London County Council, and before that to the Metropolitan Board of Works. He had been one of the Gas Examiners before 1882; and since then he had been Superintending Gas Examiner. He had studied the Bill, particularly the part of it which related to the testing of gas. The Bill was to authorize an improved method of testing the illuminating power of gas. At present, the illuminating power of the gas was ascertained by a method prescribed by the Gas Referees. They appointed certain stations; and they prescribed a certain area within which the Gas Company had to provide a station. The Company had to find a house or room, and submit it to the Gas Referees; and this being done, the Referees prescribed the apparatus which was to be provided and fitted in the room by the Company. When the Company had provided the apparatus, the Gas Referees inspected it; and if they approved of it, they certified it as fit and proper. Then it was the duty of the controlling authority of the London area to appoint two Examiners to test the gas. A report was submitted to the Gas Referees, to the Chief Gas Examiner, to the controlling authority, and to the Company, communicating the result of the test which was made each day. The methods to be adopted by the Gas Examiner were laid down minutely. The Gas Referees and the Chief Gas Examiner were appointed by the Board of Trade; and neither the County Council nor the Corporation had any control or voice in the matter. The Gas Referees had power to prescribe a testing-place anywhere they pleased; but as the Companies found the instruments, the matter was entirely in their hands. The arrangement worked fairly well in the majority of cases; but there had been serious difficulties. For instance, in one case the Company flatly refused for about three years to provide a station; saying it was not wanted. It was only on the friendly offices of the Board of Trade being invoked that the station was established. Frequently, a station would be closed for eight or nine months for alterations; and during this time, there was absolutely no safeguard to the public as to the quality of the gas. There was always considerable delay between the request to erect a station and its establishment; and it was therefore necessary to have some addition to the power of testing. In consequence of frequent complaints as to deficiency in the illuminating power, in 1884 he was instructed to ascertain whether or not it was possible to test the gas in various parts of London independently of the official testing-places. Complaints had often come from districts where there was no testing-place. He consulted Messrs. Sugg and Co., the makers of the apparatus prescribed by the Gas Referees, whose experience of photometric apparatus was unique, and other gas engineers, with the result that forms of photometers were devised which met the requirements of the Gas Referees in regard to the official testing-places, but which also were of a portable character. They could be put in boxes and taken from place to place.

Mr. TALBOT: I understand that the portable photometer in its essence is the same as that used as a fixture at certain stations?

*Witness:* Yes; that was a condition—that it should be identical.

Before using it, in addition to consulting the people you have named, you submitted the instrument to the Gas Referees themselves?—Yes. I asked the Referees if they considered it a proper instrument to employ in testing the gas. I fortified myself in that way; and I was assured by them that they had had it in their place under inspection, and that they considered it a proper and correct instrument, and such as they could certify under their powers.

Mr. TALBOT (to the Committee): As the Gas Referees are officers of a Government Department, it would have been impossible for us to have called them here as witnesses for the Bill; but if the Committee wish to hear their views, and will convey a request or intimation to that effect to them, I have no doubt they will come to be examined.

Mr. LITTLER: If we have this evidence at all, it should be at first-hand, and should not be given through this witness.

Mr. TALBOT (to witness): Having made all these inquiries, you proceeded to use the instrument?

*Witness:* Yes; and I have used it ever since.

In your judgment, is it a true and satisfactory instrument for testing gas?—Undoubtedly.

Do you see anything in it unfair, from the point of view either of the Company or consumer?—I believe it to be perfectly fair to both.

In conducting your experiments, you were careful, were you not, to go to places where there was a good consumption of gas?—Yes; it would have been folly to have taken the instrument to a place where there was practically no gas consumed—say, to the dead-end of a small bye-street. I selected public institutions, as far as possible, the town hall, the fire-brigade stations, the police stations, but mainly small board schools, as being the most convenient places in which gas would be burning every hour. The mode in which the tests will be carried out under the Bill will be supervised by the Gas Referees.

Examination continued: In 1897, he submitted a report to the Control Committee embodying the results of certain tests he had made. It was dated Jan. 29, 1897. He had a tabulated statement attached to it, and it showed the quality of the gas of the three Companies as tested by the instrument. The general result was that from 1884, when the tests were commenced, to 1889, the gas supplied by the Gaslight and Coke Company and the Commercial Gas Company showed an average illuminating power of 16·4 candles. This was an admirable result. There were occasions when the isolated tests were different; but that was the average—it fluctuated from 15 candles. If this state of things had been uniform, there would have been nothing to complain of; but depreciation of illuminating power was shown as the result of further tests. In the case of the South Metropolitan Company, the gas, which showed an average of 16·4 candles in 1884, in 1885 went down to 15·2 candles, and continued at this figure in 1886 and 1887. It went down to 15 candles in 1888; it was 15·3 candles in 1889; and then in 1892 it came down to 15·2 candles, and in 1893 down to an average of 14·2 candles. After this date it went up, and became 15 candles; and since that there had been another deterioration.

One of the Counsel for the petitioners here observed that there had been no deterioration in the official tests.

*Witness* said that was so. The official tests had given uniform results.

The CHAIRMAN: Did you make any alteration in your method of procedure down to 1889?

*Witness:* No.

Mr. TALBOT: During the whole period the official tests gave substantially uniform results?

*Witness:* Yes.

Whereas there was great difference in the tests conducted by you in the same manner throughout?—Yes.

Now as to the effect of enriching the gas. In 1894, or before, you conducted experiments as to that, did you not?—Yes; it was an experiment carried out at the suggestion of Mr. Livesey himself.

In reply to further questions, witness stated that the proposed mode of testing the gas was said to be unfair because the gas lost in illuminating power while it travelled along the mains.

Counsel for the petitioners remarked that there were a lot of other objections.

Mr. TALBOT said he was aware of that. He asked witness whether, in his view, gas lost in illuminating power at all, or to a great extent, in travelling along the mains.

*Witness* said it did not lose to any material extent. There was no quibbling as to half-a-candle, or even a whole candle, of illuminating power. It was a matter of 3 or 4 candles; and in such a case no question of depreciation in the mains could enter into account at all. Asked as to the result of his experiments in regard to enrichment of gas, witness said that enrichment meant that when a gas was made from coal according to the quality of the coal used, and the temperature at which it was distilled, so would they have greater or less illuminating power. It was the duty of a gas company to so blend the gases as to give as uniform a gas as possible. If a sufficiently rich gas was not procured, it became part of their duty to add something to enrich it. In consequence of a suggestion made by Mr. Livesey in 1894, as to the possible effect of unenriched gas, an experiment was made in the South Metropolitan district, with the sanction of the Gas Referees, for a fortnight during which unenriched gas was supplied by the Company to the whole of the district. It was arranged that they should ascertain, by careful tests conducted in the usual way, what would be the effect; and it was also arranged that if there was any appreciable difference during the period when the gas was unenriched, it should be indicated by the complaints received from consumers of gas, just as, when gas was not delivered at proper pressure, people wrote to say that something must be wrong. His report* was as follows:—

In accordance with the order of the Committee of the 13th of April last, I arranged with Mr. Livesey that the enrichment of the gas supplied by the South Metropolitan Gas Company should cease on the 24th of April and be resumed on the 6th of May. During the interval, the gas was carefully tested as usual at the official stations, and also by means of the portable photometer at various points from Battersea to Plumstead; this instrument being taken into the official testing-stations from time to time for comparison with the legalized photometric apparatus. I now beg to submit the following outcome of the testings so made, together with a consideration of the results of the adoption of such an alteration in the existing standard, should such be further entertained, and recommendations with respect thereto. Table No. 1 contains the results of the tests of the illuminating power of the gas during the supply of uncarburetted gas from the 24th of April to the 5th of May.

Then Table I. followed, giving the tests of the illuminating power of the uncarburetted gas supplied between the dates named. The tabulated results might be thus summarized: Average of portable photometer tests at board schools, 15 candles; average of official examiners' tests, 15·1 candles. The report proceeded as follows:—

The higher result of the official examiners' tests is caused by the fact that, while the average at all stations was 15·1, the returns from the Clapham station alone gave an average of 15·8 candles. The remarkable agreement between the indications afforded by the portable photometer and the official instruments is worthy of note, and is well shown by the following comparison: (1) Candle tests on portable photometer at the official stations, 15·70; (2) candle tests on the official photometer at the same time as the above, 15·75; (3) candle tests by the official examiner on the same days, but at different times, 15·75. Many other features of interest present themselves on the careful examination of the details of the testings; but the above are the essential points in connection with the scope of the present inquiry. It may now be assumed, from the results of the testings as thus set out, that the quality of the gas *when uncarburetted* is fairly uniform at the testing-stations and in the districts away from their immediate neighbourhood. The high results at the Clapham station were probably due to a special quality of coal employed at the Vauxhall works, so that the conditions in that case were exceptional, and somewhat complicate the general question. But, even with this case included, the main point is practically unaffected—viz., that with uniform manufacture there is uniform quality. The question then naturally arises, "What are the conditions of the supply when the gas *is* being enriched?" For the purpose of answering this, a series of tests were conducted on precisely the same lines as the foregoing, immediately following the resumption of the process of enrichment by the Company.

The results so obtained were tabulated, giving the tests of the illuminating power of carburetted gas supplied by the Company from the 8th to the 19th of May; being the two weeks following the experimental supply of uncarburetted gas. The report went on as follows:—

From these results the following summary is obtained: Average of portable photometer tests at board schools, 14·85 candles; average of official examiners' tests, 16·5 candles; average of portable photometer tests at official stations, 16·6 candles. As the former set of testings, made when the gas was supplied *un*-carburetted, indicated a fairly uniform supply, so these later tests, made after the resumption of the enriching process, most clearly demonstrate that the effect of that process is limited in its operation to the official testing-place and its near proximity. This remarkable result is the chief outcome of the experiments, and will explain any

* See "JOURNAL," Vol., LXIV., p. 95.

failure on the part of the consumers to detect any difference in the quality of the gas supplied to them during the two weeks in question. The importance of the prescribed quality of the gas being fully maintained throughout the whole district is more than ever fully evident. For the purpose of elucidating this fact as clearly as possible, I have made the following series of experiments to determine the quantity of gas of different illuminating powers required to produce a uniform light when consumed in either of two of the most generally employed forms of gas-burners.

Mr. TALBOT: You had the gas enriched at the testing-places up to the legal standard?

*Witness:* Yes.

And whereas the tests taken by your photometer at the testing-places coincided with the official test, at the board schools they fell considerably below it?—Yes.

The gas was enriched, but the enrichment observable at the fixed test had disappeared before the gas reached the consumer?—Yes; it disappeared as soon as we went into the district away from the official station. The average by the photometer at the board schools was 14·85 candles. That was some distance from the testing-stations.

The CHAIRMAN: Are the testing-stations referred to in the report in proximity to the board schools?

*Witness:* Not necessarily. I tried to get the average of the gas supply in the district. The result was that the uncarburetted gas was practically the same as the carburetted gas, so called, when it arrived at the consumer's burner.

Mr. TALBOT: It has been suggested that gas of high illuminating power is not better than gas of lower power for purposes other than lighting—take heating, for instance.

*Witness:* That question will be dealt with by others, as it refers to a special point. In my report, I dealt more particularly with the effect of the supply of poor gas as bearing upon light. I gave Table III. showing the consumption of gas required to yield a certain constant light; and the report said:

From these results it appears that, in order to obtain the same quantity of light from a batswing burner consuming 14-candle gas as would be obtained with 16-candle gas, about 5 cubic feet per hour must be consumed, instead of 4 cubic feet, or 37 per cent. more. With 15-candle gas instead of 16, the increase is from 4 to about 4¾, or 18 per cent. With a fishtail burner, the increase in the quantity of gas, when 14-candle gas is employed, is about 33 per cent., and when 15-candle gas is used about 18 per cent.

Some people would contend that these figures are too high.

Mr. TALBOT: Can you speak as to economy to the consumer?

Mr. BALFOUR BROWNE: Cases can be cited where 16-candle gas has been reduced to 5 candles by the use of bad burners.

Mr. TALBOT: It is argued that it does not matter to the consumer what candle power he gets, because he can improve his gas by using a good burner.

*Witness:* That, of course, is not a sound argument, because if the gas is poor when burnt in the ordinary way, it involves a great loss to the consumer. He has to burn more gas to get the light he would have with gas of a better quality.

The CHAIRMAN: If he uses the gas with the burner you have employed in your experiments.

*Witness:* I have given in a statement of loss with a certain burner. But whatever standard of burner you adopt, there must be a provision for protecting the consumer.

Cross-examined by Mr. POPE: What is the necessity for erecting and fitting a testing-place—what do you provide in a proper testing-place?

*Witness:* Apparatus for testing the illuminating power of the gas.

What is the nature of the apparatus. You must first of all have personal supervision?—The Gas Referees specify a certain area within which the Company must find a suitable house. The house is provided, and the room; but some rooms are different to others. If the room is not satisfactorily supplied with ventilation, very often a ventilator is found.

The ventilation of the room is an essential condition to correct testing?—Clearly.

What is the next condition?—In an official testing-station, the test extends over 24 hours. The gas is being burnt in the room all the time; and you must provide for that.

What has to be provided to secure an accurate testing-station? Has the room to be darkened?—Yes.

Painted black? Did you ever know one that was not painted black?—It is only within the last few weeks, so to speak, that they have been painted black.

Why have they done that?—Because of the introduction of a new photometer—Harcourt's pentane photometer.

A fixed station and appliances are necessary?—A great many things that are done in the station are absolutely unnecessary.

Do you mean to represent to the Committee that, in your judgment, the fittings of the station must be brought to the fixed station before you can get a really accurate test?—I do not think so. A great deal of that which is done at an ordinary gas-testing station I look upon as an excuse for delay.

That is the getting ready?—When everything is ready. They have the key of the testing-station for months.

Your portable photometer does not test as you test at a fixed station?—Yes; we use it alongside the instruments at the stations.

I am not talking about the accuracy of the photometer, but of the test. Do you think that your peripatetic photometer would test accurately without any of the conditions necessary according to the Gas Referees?—The Gas Referees prescribe the instrument to be employed; but all the paraphernalia is looked on as unnecessary. We test the quality of the gas first of all by putting up a photometer in any convenient room where the gas is laid on, and where it is not open to daylight.

Mr. POPE: Assuming you are using a board school, having found the place, what would you do to test the gas?—Say we were testing in this room. We should bring the portable photometer, and put it on this table (pointing). I submit that the conditions as to temperature and ventilation in this room would entirely meet the requirements of the Gas Referees, so far as they have any requirements. I should wait until the room had been emptied for a few hours, and I had normal conditions as to purity of atmosphere.

Is your photometer independent of the consideration of draughts, ventilation, darkened room, or the ordinary conditions that affect gas testing?—You ask me a question covering an enormous area of ground, and you want me to say "Yes" or "No."

Do you suggest that the photometer you employ in this casual way is independent of these conditions of darkened rooms, draughts, ventilation, and so forth?—I say you are putting a question which covers a large area. My answer is that the instrument, whether it be good or bad, is an instrument which is true, and is designed by the Gas Referees themselves; and they are the responsible authority under Parliament for certifying as to the quality of the gas.

I am not disputing the accuracy of the instrument *quâ* instrument; but I say that the accuracy of the result derived from it must depend on the conditions under which it is used?—The instrument and the conditions under which it is used give fair and accurate results between the Company and the consumer.

Do you assert that the instrument is independent of the conditions I have referred to in its manner of use?—Well, no flame of any kind can be altogether independent of atmosphere.

Would your instrument be useful in the open air?—No. The flame would be blown out.

The CHAIRMAN: Is your instrument as sensitive as the fixed instruments?

*Witness* indicated a reply in the affirmative.

The CHAIRMAN: I do not understand the witness to imply that, if you took his instrument into a hurricane, it would work satisfactorily.

*Witness:* No. It would work in this room with ordinary accuracy.

Mr. POPE said the portable photometer was practically the same instrument as that used at the fixed stations; and when witness said that it could be employed under circumstances in which the ordinary conditions required at the fixed stations were absent, he implied that those conditions were unnecessary.

*Witness* said that was so. It was the Companies who had introduced all the paraphernalia.

The CHAIRMAN: Do the Referees lay down any conditions as to the blackening of the ceiling and walls?

*Witness* replied that the Referees had done so.

The CHAIRMAN: In your opinion, would it make any difference whether the walls of the room were black or not?—I do not think so.

Cross-examined by Mr. LITTLER: You know that the City Authorities are absolutely and diametrically opposed to your scheme.

*Witness:* It is the first time I have heard of it.

Then, do I gather that this Bill has been brought in without consulting them?—I do not know. I no longer hold an official position under the County Council. I resigned it some three years ago.

The reason you give for promoting the Bill is that it will enable you to obtain better illuminating power for the consumers at the same price?—We do not think that it will come to a question of price at all. But the consumer would be better off with 16-candle gas at 4d. than he would with 11, 12, or 13 candle gas at 3d.

Would he?—Clearly.

Do you know that a large proportion of the burners now supplied are not of the old pattern, but are either of the incandescent or the regenerative type?—I have considered that question; and I want evidence, if it can be obtained, to show that the quantity of gas used in any of these new burners bears any proportion at all to the vast volume of gas consumed in London for illuminating purposes.

Mr. LITTLER: That want will be supplied.

*Witness:* I have been about London a great deal; and from what I see, it appears that the great bulk of the gas is burnt in the ordinary flat-flame burners. The other, and more economic, burners have hardly touched the fringe of the matter, though I cannot say what may happen in ten or twenty years' time.

For cooking purposes, you will agree that 14-candle gas is as good as 16-candle gas?—I have no evidence to that effect; and I do not think it is so.

Was this Bill brought in on your advice?—I have had nothing to do with the County Council for some time; but I presume the measure is brought in as the result of work I did years ago.

Questioned as to the tests which he had made with the portable photometer, witness said they were generally conducted in board schools—three or four of them between 6 and 10 o'clock at night in the winter, and later in the summer.

Mr. LITTLER: According to the Bill, there is nothing to prevent you going with your testing apparatus to the back bedroom of a working man at the dead-end of a gas-main?

*Witness:* It is intended that the testings shall be effected under the control of the Gas Referees; and I should think that such a suggestion as you make would be unworthy of them.

Have they ever made a suggestion that the tests you propose should be applied?—Yes; over and over again.

In any published report?—I do not think so.

I do not refer to what somebody may have said when smoking a cigar with you. Is there any suggestion of the kind to be found in any published records?—I know of no printed matter in which they say so.

In reply to further questions, witness said that the photometer he had used was made in 1884 by Sugg. It had had over 3000 cab journeys; and was in good working order. The portable photometer could be put together in ten minutes; and he entirely differed from the view that it took two hours to do it properly. All the measurements were tested with rods after fixing the photometer. There was no extraneous light in the room; and he did not think it necessary that the ceiling and the walls of the room should be blackened.

Further cross-examined by Mr. LITTLER: He agreed that if the proposal were adopted, the Companies would have to send out at the starting point better gas than they did at present. He could not tell whether it would cost more to send out the higher quality of gas—nor that every candle above 14 meant an extra 2d. per 1000 cubic feet.

Mr. LITTLER: If it does, and if we are required to add 2 candles in order to comply with the obligations of this Bill, do you know that that means half-a-million of money to the consumers?

*Witness:* I am not concerned with that at all.

Cross-examination continued: As to whether it would be a good thing for the consumer if the Companies were compelled to add 4d. to the price of every 1000 cubic feet of gas sold, he held it would be more economical

to the consumer that he should pay the extra cost, whatever it was, and have the gas up to standard, rather than receive the gas he was getting now. If a man were supplied with 14 instead of 16 candle gas, he would burn 25 per cent. more; and the difference in the light would be very considerable. A great change had of late years occurred in regard to the higher illuminating powers of gas in connection with such burners as the Welsbach; but it was not a question of what light a particular burner would give, but of what the consumer paid for and was entitled to. He agreed that, as soon as one left the main and entered the consumer's premises, the management and control of the supply-pipe—whether it was in proper order or not—was entirely in the hands of the consumer. If the Bill provided that the tester could go to a back room (say) it should be revised, because that was not fair to the Company. Gas deteriorated in small branch mains, especially if they were not kept in repair; but that was a very limited condition in relation to what the County Council proposed.

By the CHAIRMAN: In the worst circumstances, the depreciation might amount to a candle; but that would be in very small mains. In large mains supplying a district, the diminution would not be more than half-a-candle, which was allowed for under existing conditions.

Further cross-examined by Mr. LITTLER: He had heard something of skin-friction in smaller pipes. He would not say it did not take place. Stagnation in the pipes might bring about like effects; and the same would occur if the test were near a dead-end.

Cross-examined by Mr. BALFOUR BROWNE: The object of the Bill was to allow testing anywhere, instead of at certain fixed places. Gas lost illuminating power if it passed through a pipe where there was a small flow; if it was exposed to cold; by the deposit of naphthalene in passing through a service-pipe; and by passing through a pipe in which naphthalene had been deposited. It would not lose power in passing through a wet meter in which the water was saturated with gaseous products. In a dry meter, to prevent the gas escaping, the leather was saturated with oil; but this did not lessen the illuminating power. The wet meter was the only one which the Gas Referees said could be used to test. To a certain extent, also, gas lost power by travelling long distances through pipes or mains. So that in six cases there was a potential loss of illuminating power between the manufacturer and the consumer.

Mr. BALFOUR BROWNE: These losses are not due to the action of the maker of gas, but may be due to the default of the consumer?

*Witness:* Yes.

Do you think it fair, when we have bargained to supply gas at 16-candle power in one place, that you should have a right to demand it, after all these conditions had been put upon us, at another?—There must of necessity be a certain limit to all these causes of reduction; and this limit I will grant the Companies. It is conceded to them by a concession of half-a-candle; and I would give them another half-candle.

It depends whether that is fair. If, for instance, I can show that the gas tested at one of these stations is 16-candle gas, and I can prove that, by no fault of mine, but merely by travelling through the pipes, it had lost 2 candles before it had reached the extremity of any district, I should have 2 candles allowed?—But at the same time that the official testing is going on at a station, at another point between that station and the works there is a difference of 3 or 4 candles. I cannot understand it.

Mr. BALFOUR BROWNE said the witness might not be able to understand it; but that was no reason why, having bargained to give 16-candle gas at one place, the Companies should be bound to give it at another.

*Witness* remarked that there was another thing he could not understand—viz., why at a testing-place the gas should be 15·8 candles and then drop down to 14·6 candles.

Cross-examination continued: At present, in the tests the gas was not always protected from the atmosphere. In some cases it was exposed to cold. The Companies at the testing-stations did not pass the gas through a consumer's meter. If there was anything in the points raised, they might safely be left to the Gas Referees. Such matters as a mirror in the room where the test with the portable photometer was made, and the having of walls some polished and some dark and absorbent, were microscopical questions, which would affect the test to the extent (say) of a tenth of a candle. The keeping of the temperature at the testing-places up in the winter with hot-water bottles, and down in the summer by means of ice, were coddling things used to get even results.

Re-examined by Mr. TALBOT: There was nothing in the requirements of the Gas Referees for the current half year which could not be met by the portable photometer.

By Mr. NICOL: The selection of the testing-places was by the Gas Referees, not by the Companies.

In further re-examination, witness said he had taken tests between the works and the testing-station, which showed that there was less power in the gas at the works than there was at the station.

Mr. POPE: Do you allege fraud?

Mr. TALBOT: There is no suggestion of fraud.

Mr. POPE: Do you secretly allege that gas is fraudulently brought up to the requisite quality at the testing-place, which, before it reaches the testing place, is below it? What do you allege?

Mr. WORSLEY TAYLOR: I do not know that we are bound to allege anything more than the fact. We state the facts. We say the consumer is entitled to 16-candle gas; and he does not get it. He is entitled to be sure that he gets it. What inference my learned friend chooses to draw, we cannot help.

Mr. POPE: I should like to know how it is done.

The CHAIRMAN: I suppose that witness would say he does not know.

*Witness*, in reply to Mr. EMMOTT, said, curiously enough, some of the tests had given better results when taken at the end of the district than nearer the works. He knew nothing about the pipes. There was no means of getting gas direct from the mains, except by breaking up the road. He made a suggestion to some of the Companies years ago that they should have an investigation on this subject, there being some discrepancies which were very inexplicable; but his suggestion was not adopted. For all the variations mentioned, the allowance of half-a-candle was sufficient.

By the CHAIRMAN: He wished to make no insinuations against the Companies, because there were such things as careless workmen and other circumstances which might explain a great deal. He could only say that gas at a certain point, at a certain time, had a certain value. He did not wish to draw inferences against the Company.

The CHAIRMAN said he was not asking whether he imputed fraud to the Companies. Did witness know, from the construction of the mains, whether it was possible that the Companies might divert from any one of the given stations the gas which was made at the nearest works, and bring into that station gas produced a considerable distance away?

*Witness* said they had an illustration of that in regard to sulphur in gas. To come within the Act, there must be an excess on an average of three days at one testing-station. Evidence was given that gas was found at one station with a high quantity of sulphur in it; but they managed to drive this gas in such a way that it was tested one night at one station, the second night at another, the third at another—so that, although there was a high average of sulphur at three stations, there was not a high average at one.

The CHAIRMAN: So that the test at a given productive works must not necessarily correspond with the test at the nearest testing-station?—I understand that that is so.

Because the gas supplied at a testing-station may come from another works?—Yes.

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**Thursday, April 5.**

The CHAIRMAN said he had arranged for the attendance of Mr. Vernon Harcourt, one of the Gas Referees; and he proposed to take his evidence first. He would obtain a general statement from him; and then, in conformity with the usual practice, Counsel would not cross-examine. But if there was any point on which Counsel would like further light, and they submitted the question, he (the Chairman) would use his discretion as to putting it.

Mr. *A. G. Vernon Harcourt*, examined by the CHAIRMAN.

Witness said the principal duties of the Gas Referees were to prescribe the degree of purity of the gas supplied by the Companies, and the places, methods, and apparatus for testing the illuminating power.

The CHAIRMAN: What is the apparatus which is now generally used for testing the illuminating power?

*Witness:* There is a photometer newly introduced into most of the testing-places, of a form called a table photometer, on which the comparison is made between a standard light of 10 candles and the gas supplied by the Company. The comparison is made by burning the gas supplied by the Company in a standard burner, known as the "London" argand burner, at such a rate as will produce a light of 16 candles. The actual illuminating value of the gas is decided upon by the rate at which the gas has to be burnt to produce this amount of light.

In practice, does an inferior gas of (say) 14 candles require a certain increase in quantity to give an illuminating power equal to 16 candles?—It would be on an exact proportionality between the two; so that 14-candle gas in relation to 16-candle gas would be gas which would need to be burnt at the rate 8, when 16-candle gas would need to be burnt at the rate 7. Continuing, he said he had only a small knowledge of the portable photometer now being used by the promoters of the Bill in making their tests. He believed that, as used side by side with the fixed photometer, and under the same conditions, the portable instrument was satisfactory.

Is it more subject to interference with its action than the one you used—the table photometer—by such things as draughts or conditions of temperature?—The instrument, I think, is the same, except that portions of it are so made that they can be folded up, and so made more portable. When set up in a room, you may take it there is no appreciable difference. The photometer Mr. Dibdin used is of the type known as the open-bar photometer; and when that was employed, the photometers at the different testing-places were more or less enclosed. It was, therefore, probably more likely to be affected by draughts than screened instruments. The open-bar photometer is not, however, now used.

Then, in an ordinary room, with the windows closed and not subject to more draught and currents of air, do you think that the testings made by the portable photometer would fairly represent the illuminating power of the gas?—I think it may happen that, in a room much larger than those which form the testing-places, even if the windows and doors were closed, the currents of air would be greater than in a smaller room; but I do not see why these currents of air should more affect the gas burning in the standard than the gas burning in the "London" argand burner. I should have answered the question differently at the time candles were used for testing, because they were very liable to draughts; but as between the burners now being used, I see no reason why one should be more prejudicially affected by draughts than the other. Some candle testings are still going on; but by now the greater part of the testing-places have been fitted with the new apparatus. The location of the testing-places is determined by the Referees. Each station had come into being in consequence of the original provision that for each centre of gas manufacture there should be a testing-place, not less than, but as near as might be, 1000 yards from the works. At present, and for many years past, the policy of the Gas Referees has been to place a testing-place in each centre of gas consumption, at something like regular intervals, and to arrange that the number of these places should bear some proportion to the amount of gas supplied by each of the Companies.

Can you give us any information as to the difference between the illuminating power of a given gas immediately proceeding from the works, and the illuminating power of the same gas when tested at a distance of 1000 yards?—I have no knowledge first hand. It was stated at the time the Beckton works were established 10 miles out of London, that the gas made there, and travelling with great velocity through mains 4 feet in diameter, did not lose in transit, but was of the same quality when it arrived as it was when it started.

Then you would not anticipate that there would be a difference in the illuminating power of a given gas tested 1000 yards from the works, and then tested again 3000 or 10,000 yards distant?—I think much might depend on the size of the pipe through which the gas travelled. If, in place of this large main from Beckton to London, gas had travelled 10 miles through a number of smaller mains or service pipes, it seems to me that the gas would have lost in quality.

Can you give us the reason why you would expect it to lose?—No; I find it rather difficult to assign any other reason than this—that it was so. Continuing, witness said he did not understand, as a matter of physics or chemistry, how any deterioration of the gas could take place. The effect of leakage would not diminish the illuminating power. The

illuminating power would not, he thought, be affected directly in travelling long distances by going up hill or down hill. The explanation of gas at high altitudes being supposed to be purer than gas at lower heights, was that the great bulk of the complaints of gas being bad meant that it was not supplied at a sufficient pressure to enable the consumer to get the light he needed. This was by no means necessarily due to fault on the part of the Gas Companies, but might—and often did—arise from a consumer putting in fittings, and then increasing his use of gas without adopting larger fittings; so that, although the pressure was sufficient in the mains, it would not be sufficient for the small pipes, and thus the consumer complained. On the higher level, the pressure would be greater; and there would be far fewer complaints from the top than the bottom of a hill.

Then the illuminating power of gas is, in your judgment, frequently affected by the service-pipes which are controlled and provided by the consumer?—That is so. I do not know a scientific reason why the gas should suffer in passing through the pipes.

The illuminating power of the gas may be affected by the insufficiency of the service-pipes?—The amount of light obtained from gas; but that is generally distributed into two parts—the actual quality of the gas, and the pressure at which the gas is supplied. I think you must exclude gas pressure from the illuminating power.

But the ordinary man in the street, who had supplied his house with service-pipes under the conditions you have named, would naturally think the gas was inferior, when he himself was to blame, because the service-pipes were not sufficiently large?—Yes, he probably would. He would be wrong in thinking the gas deficient in illuminating power.

Might the testing with this photometer be seriously affected by being applied on premises where the local service-pipes were inadequate to the consumption?—I do not think that is a real danger.

Would the illuminating power be affected by the fact that the gas passed through a wet or dry meter?—Not permanently. If the water in the meter were clean, for a short time before that water became saturated with the gases forming coal gas, the gas would suffer in passing over the water; but this would be limited to a week or two.

Would there be any difference in testing with the portable photometer on the sub-mains of 2 or 3 inches diameter, as compared with the main supply mains of 2 feet diameter?—I should not expect it. I cannot say positively, because I have not tried it; but I do not suppose, if gas passed through some distance of pipes after leaving the main, the quality would be affected. At any rate, it is under those conditions the consumers receive their gas.

Have you found any variation in these testings at different distances from the sources of supply, in the case of an enriched gas as compared with gas not enriched?—A great difference, I think—meaning now, by enrichment, the mixing of the vapour of petroleum with gas. I think it is a point of very great importance. The mode of enriching gas is now, I believe, to inject petroleum in some form into it.

Does the testing vary when the gas is at a lower or at a higher temperature?—I should think, under the present conditions of supply, it must be more likely that the gas would be poor in quality, owing to the condensation of some of this enrichment, when the temperature is lower, than when the temperature is higher; but I do not suppose the range of temperature in mains buried underground would be very large. It might certainly happen that, if a portion of the service-pipe bringing gas from that main travelled near the surface of the ground, in cold weather there might be a loss of illuminating power in the gas passing through the pipe. On the other hand, it seems likely that that which is condensed when the pipe is cold, will be again given up to the gas when the pipe is warmer. Therefore, I do not think there can be any permanent loss.

Then, in making a test, would the temperature of the room in which the test was performed affect the results?—I think not. The higher temperature of the air increases, no doubt, by a little the brightness of any flame burning in the air; but I think there is no likelihood that the standard light and the gas light would be affected to a material degree.

Turning to the subject of the installation of testing-places, you say you appoint the areas within which the testing-stations shall be situate?—Yes.

Have you had any experience of delay on the part of the Companies in providing these places?—There has often been a long gap; but it is difficult to say who has been responsible for the delay. We have received letters from the Companies regretting that those who had to supply the apparatus had been so long in their operations.

Have you known cases in which, after the testing-places have been appointed and furnished, delay has taken place in handing over the keys?—I do not think there has ever been any long delay in that way. We have had letters from one or other of the Companies asking that they should have the opportunity of testing the apparatus before it was brought into official use; and I think we have acceded to applications of this kind. The officials of the London County Council would know more about that than we should, as they have had more to do with these matters. So far as we are concerned, we should receive from the Secretary of the Gas Company an intimation that the testing-place we had prescribed was in readiness for our examination; and we should then go down and examine it. We might find one or two things not satisfactory, and require them to be remedied, when we should go down again.

Is it, in your judgment, a matter of importance that the walls and ceilings of the testing-places should be coloured in any way?—I think not, if the room is well darkened. You can provide, with black screens on the photometer itself, for the shutting out of extraneous light from the surface of the instrument.

Using such precaution, is it not a matter of importance that the walls and ceilings should be darkened?—Personally, I have never thought it of importance. The walls become black when the room is darkened.

In the South Metropolitan district, there appears to be a large area where no testing-station is provided. Do you think it necessary that further testing-stations should be established in the outlying districts, in order that the consumers may be assured that the gas supplied to them locally is of the quality prescribed by the Act of Parliament?—Yes; I think there should be a testing-station not very far from the places where gas is supplied. We are sometimes asked that testing-places should be supplied; and sometimes we have, on our own motion, prescribed additional testing-places. So far as my knowledge goes, I should not like to say that the testing-stations are sufficiently numerous. There might be room for another; and I should not like to say that we have reached finality in the matter. It is our duty to prescribe fresh testing-stations when they are required; and we do so from time to time.

Mr. Nicol: You say that the first testing-stations selected were not 1000 yards from the works, and that that policy of yours was under powers now repealed?

*Witness:* I am not sure whether that is right. I think it is as nearly as may be 1000 yards. That is now repealed.

By Act of Parliament or by the Board of Trade?—I believe the change was made in an Act of Parliament.

When the change was made, were future stations put in the power of the Referees?—Yes.

So that you have the power of selecting additional stations wherever you think them desirable?—Yes. If there are not sufficient testing-stations, it is our fault, and we are responsible.

The matter is one for your discretion?—Yes. The reason for not being always ready to comply with suggestions, is our knowledge of the considerable expense thrown on the Gas Companies by the provision of these testing-stations.

Do you think it would be desirable that testing-stations should be established anywhere, at any point, over the areas covered by the three Gas Companies—that they should be allowed, if applied for?—I do not think it desirable that there should be a large multiplication of testing-stations such as now exist; but there is the other question to consider—viz., whether it is desirable that testing at other places than at the stations which now exist should be allowed.

Have you read the Bill?—Yes.

In part 2, there is a section which says that any Gas Examiner may at any time make, at any place within the districts supplied by any of the Companies, tests for ascertaining whether the illuminating power of the gas supplied by such Company at such place is that required by law. To a large extent, the Gas Examiners, if that clause is accepted, at any place over the whole area, could go with their portable instrument, and set up a testing-station?—I should not describe it as setting up a testing-station, but as making a test.

Do you think it would be desirable and just that a policy such as this should be adopted?—I think that, if it were adopted, there should be a limitation. I do not think it fair to a Gas Company that tests should be made at the extremities of a district, or at places where the gas supply is very small, and where there is a possibility of the illuminating quality becoming vitiated. The power is one which might be abused if it was as large as the Bill proposes. I do not say that it would be abused, because I consider that the officials of the London County Council would consider it unfair to take extreme cases. Short of that, I do think that testing from place to place would give useful information as to the quality of the gas supplied that cannot be obtained by the present system.

Do you think these testing-places should be at reasonable distances in the area, so that you should not crowd the district with them?—Yes. For example, I think that the system of going to board schools is a good one. These seem well-chosen places. They are generally in populous parts and leading thoroughfares, where there are large gas-mains.

A town hall would be a good place?—Yes; anything of that kind.

Take the works at Beckton, which are comparatively new, do you think that the gas supplied through large new mains from such works would be more likely to retain its illuminating power than gas supplied through the old mains of the Gaslight and Coke Company and from old works?—No. I do not think that the gas travelling, in the short time that it takes it to travel, would be different coming through old mains than it would if it came through new mains. I am not aware of any difference in the quality of gas being due to the age of the mains it passes through.

Mr. Stanley Leighton: Are the testing-stations intended to secure 16-candle gas for all the consumers?

*Witness:* That is a question for the Committee.

Do you think that the test made by a portable photometer is a fair one?—Yes; if the instrument is rightly used—that is to say, if it is used in a place free from draughts, and under proper conditions as to light.

Is the expense of the moving photometer trifling?—Quite.

Is the exaction of penalties in the discretion of the Gas Referees or the County Council?—The County Council have to sue for penalties before the Magistrate.

But it is in their discretion whether they shall sue or not?—Yes.

Therefore it is not obligatory to penalize the Companies, even if the gas is below the standard?—It rests with them to take proceedings.

Mr. Nicol: What are the powers of the Gas Examiners—they get instructions from you?

*Witness:* Yes. We lay down rules that are printed and published.

From time to time you vary the instructions?—Yes.

And are the changes based on the reports you receive from the Gas Examiners?—The changes we make are changes intended to improve the system of photometry. The system of testing by candles was very imperfect; and we have been making efforts recently to substitute the new mode, and with it some other things that we thought desirable. Our object has been to ascertain more accurately the quality of the gas at the testing-places. Our instructions have had this object in view. As to our authority, it is limited to prescribing the modes of testing. We have nothing to do with the results of the testing.

Your tests are in the interest both of the Companies and of the public?—Yes. Our object is to make the testings as perfect as possible.

For the protection of the Companies and the consumer?—Yes. An improvement in the testing would have both effects, and the gas would be more truly returned.

By Mr. Emmott: He saw no reason, in physics or chemistry, why, over a long period of time, the illuminating material should have less effect if passed through a small main some distance from the gas-works than if passed through one near the works. No doubt temperature might have an effect on the hydrocarbons in the gas. It might for a short period of time, in the cold weather, cause a temporary depreciation of the gas, owing to its being passed through small pipes; but in the warm weather, the condensation would be dispersed, and the enriching of the gas might be more than was necessary. Chemical analyses of the gas might be made; but he thought that the photometric test was a better method of ascertaining the quality. Different methods of

enriching gas might lead to variations in its illuminating power. It had been stated that the gas supplied at the fixed testing-stations was better than that furnished to the rest of the districts; and this would seem to be borne out by the results taken from particular photometers. He had, however, not investigated the matter. He should not expect to find any difference in tests which were made of gas coming from a small main and that coming from a large one.

The CHAIRMAN: In your opinion, the present testing-stations are not really a guarantee that the gas all over the area of supply will be up to the parliamentary standard?

*Witness:* That is my opinion.

Examined by Mr. TALBOT, through the Committee, witness said that section 17 of the Act of 1880 provided that if the Chief Gas Examiner was satisfied on appeal that a defect in the gas was due to unavoidable cause or accident, the Company would be held blameless. This, he thought, would meet any difficulty which might arise through deterioration of the gas in consequence of temporary cold weather.

By the CHAIRMAN: It was possible for a deterioration in the illuminating power of gas to take place in cold weather, owing to condensation of the richer parts of the gas.

Mr. BAGGALLAY: The Gas-Works Clauses Act Amendment Act of 1871, section 12, prescribes the number of candles illuminating power, does it not?

*Witness:* The Gas-Works Clauses Act has only to do with testings made in connection with other than the London Gas Companies. London cannot be regarded as being under that Act.

Do you know this question has come before the Courts?—I do not.

You do not know what the decision of the Courts has been as to the applicability of that Act to the London Gas Companies?—I do not.

Mr. BAGGALLAY: Then you may take it from me that the Act does apply to the London Gas Companies. That being so, is it not the fact that the illuminating power of the gas has to be ascertained at the testing places prescribed in the Act?

The CHAIRMAN: That goes beyond the Referees' province.

Mr. BAGGALLAY: I want to see what they test for. My point is that the Gas Companies are bound to give the illuminating power at the testing-place, and not at the point of consumption.

The CHAIRMAN: The witness, I think, has said that that is a matter which rests with the Committee.

*Witness:* I did not understand that it was a question I declined to answer. I should like to say that I think the question is of the highest importance, and one that I hope the Committee will decide—namely, whether the obligation resting on the Companies is only to supply gas of the prescribed quality to the testing station, or whether their duty is to supply it throughout their entire district. I give no opinion upon the point; but I think it is a question of the greatest importance.

Mr. BAGGALLAY: That will be a question as to the proper construction of the law.

*Witness:* Quite so.

You would not ask the Committee to decide a question of law?—I would not ask them to do so.

The Gas Referees are not restricted as to the number of testing-places they shall prescribe?—No. I do not know whether or not they are compelled to see that one is established in each gas district; but if there is one, they may have as many more as they like.

Do you attach any importance, in making your tests, to darkness of the room, freedom from draughts, and temperature?—I should in extreme cases attach some importance to these considerations. For instance, it would be impossible to take any testings at all in some conditions of the atmosphere.

Lord R. CECIL: Take the question of the possibility of the deterioration of the illuminating power of gas, owing to its passing through small pipes rather than large ones, is it not the fact that naphthalene is deposited in small pipes in certain conditions of temperature?

*Witness:* Naphthalene is deposited; and I have no doubt the temperature of the pipe is one of the conditions affecting the deposit.

If it is deposited, does that diminish the illuminating power of the gas?—Not generally. The minimum amount of naphthalene that can remain at an ordinary temperature is not such as to affect the illuminating power.

Does it not absorb the hydrocarbon which constitutes the illuminating power of the gas?—I do not know that that is the case. I should doubt its being so.

In reply to further questions, witness said that the entry of air through a leaky gas-pipe would affect the illuminating power of the gas.

The CHAIRMAN asked, as to the treatment of the delicate instrument by which gas tests were made, whether the Examiner would not protect it from draughts as much as he would protect himself.

*Witness* replied that they would need to take more care in avoiding draughts, for the sake of photometry, than they would take for their own comfort.

Lord R. CECIL asked if all the walls were blackened in the rooms used for testing purposes.

*Witness* replied that he did not think so; but he was not quite sure.

Lord R. CECIL: Do you not know that all the rooms used as testing-stations in the South Metropolitan Company's district have their walls blackened?—Perhaps so. The rooms are blackened in some cases; but I do not think the blackening is universal. We—the Gas Referees—never prescribe the blackening of the room as a condition of the test.

Have you ever taken part in testings with a portable photometer?—No; I have not.

The CHAIRMAN: Have you, as Gas Referee, the power to require the Gas Companies to give you information as to their method of laying the mains, and of diverting the mains and the flow of gas from one district to another? What I mean is, have you the power of making inquiries so as to enable you to protect the consumers from manœuvres of this kind?

*Witness:* Practically, no. No one knows precisely where the gas comes from.

Lord R. CECIL: Do you think that, under the Bill, the testing arrangements would result in requiring the Gas Companies to furnish a higher illuminating power than they do at present?

*Witness:* That, again, must depend on the accuracy of the information which has been obtained on the subject.

Assuming that the gas which travels through small pipes does lose in illuminating power, then, apart from all questions of the manipulation of gas, the provisions of the Bill would require the Companies to furnish gas of a higher illuminating power than they are at present required to do. Is that not so?—I see no reason to think that the service-pipes through which the gas would travel to be tested (say) at a board school, would be smaller than the service-pipes through which the gas now travels to the testing-places.

Do you think that the pipes that go through the board schools are of the same size, and the gas is brought in under the same conditions, as in the case of the testing-stations?—I know of no difference between the mains at the board schools and those at the testing-stations.

Do you think enrichment is or is not a desirable thing?—That touches another large question which, I think, the Committee will have under consideration later on.

The CHAIRMAN: Does not your right to instal a testing-station at any part of the district involve the obligation on the Companies to provide, in all portions of their area, gas up to the parliamentary standard?

*Witness:* If we could reasonably very largely multiply the number of testing-places, I think it would be so—if there were not some economical objections which I sympathize with on behalf of the Companies. If we could put five times as many testing-places on the map as there now are, I think we should go a long way towards meeting what is now desired.

Would not the enriching of the gas by a Company in such a way that the enrichment would be condensed, and therefore fall, after it had travelled 5000 yards (causing the gas supplied beyond the 5000 yards to be of an inferior quality), be an injustice to the consumer at the greater distance?—If the consumer is entitled to gas of the quality named. It must turn upon that. It would not be an injustice if the Company are correct in the contention that their obligation is only to supply gas of the right quality at the testing-station.

Would it not be a delusion to say that 16-candle gas was being supplied when, as a matter of fact, it was only 16 candles at a distance of 5000 yards—when, to the knowledge of the Company, at a distance of 10,000 yards condensation would have taken place and the quality deteriorated?—I think so, on this supposition. It all turns on the obligation of the Companies.

By Lord R. CECIL: He thought enrichment was necessary, while the Companies were under their existing obligations.

Lord R. CECIL: Supposing you were creating a new system, would you provide for enrichment?

*Witness:* That must depend on whether in the future the Companies are to be required to supply gas of the same quality as at present.

You assent to the view that, if they are required to supply 16-candle gas in this way, it must be done by enrichment?—Yes.

Do you think that is a desirable thing?—It is a necessary thing.

By Mr. DANCKWERTS: He could not say certainly what would be the candle power of gas produced from ordinary coal; it would be about 14, or rather lower. Very likely it would cost more to enrich gas by a second candle power than to increase it by the first, and still more to add a third candle.

Mr. DANCKWERTS: Would it not be more in the public interest to get a cheap gas produced without enrichment, and to use a better class of burner, and so get a higher degree of light?

*Witness:* That is the object of the South Metropolitan Bill. I am inclined to think so.

This question of candle power is closely bound up with the cost of production and price of gas?—They are all connected.

Did the illuminating power form part of the settlement of 1876?—Yes.

When the question of the standard price, and all that sort of thing, was considered, and the price was fixed?—No doubt, the price fixed would have been different if the illuminating power agreed upon had been different.

Then, I take it, your view is that anything which would compel the Company to supply a higher quality of gas would necessarily affect the settlement come to as regards price?—Provided the Companies are now fulfilling their entire obligation. It would really depend upon whether, when this agreement was arrived at, it was intended that the Companies should supply gas of the prescribed quality throughout the district. If the only effect of the change is to secure that the Companies do so, I do not think any cause would have been made out.

The real practical effect of the Bill is that, if the testings are made as proposed by the measure, then the Companies can be penalized?—As upon the official results now.

At present, there is nothing to prevent the London County Council or any other person testing the gas?—That is so.

But they cannot get a penalty—that is the sole object of the Bill?—I do not think it would fairly represent the object of the Bill to say it was to penalize the Companies.

This peripatetic photometer would penalize the Companies for defective quality of the gas supplied at any point which the Examiner chose to select?—If the gas at such a point were found to be below the quality prescribed by the Companies' Act.

Would not the effect of this peripatetic testing be always to ascertain the quality of the gas, not as made and distributed by the Companies, but as made by the Companies after undergoing the effects of local influences?—The effects of distribution—not as made, but as distributed.

Supposing that, in the mains of any Company, the gas was really of the statutory quality, after passing through the consumers' service-pipes, and by other accidents, it may lose its power?—It might; the consumer might get less pure gas.

Are you aware that the settlement of 1876 was not that 16-candle gas should be supplied to every consumer, but that 16-candle gas should be made and supplied at the testing-stations?—I have never understood that to be the intention.

But supposing that is the law, the effect of this Bill would be to completely unsettle that?—The effect would be to provide more complete security for the supply.

The result would be that the Companies would have to be prepared with gas at every point where there might be a possible testing of it?—If the obligation of the Companies was to supply gas of the prescribed quality only at the prescribed testing-places, this would increase the obligation.

Do you know, in regard to every increase of price that six parts of the

increase are borne by the consumer and one part by the shareholders of the Companies?—I do not think that is a complete account of the matter. When inferior gas is supplied, the consumer uses a larger quantity. Gas of 14-candle power could be supplied more cheaply than 16-candle gas.

If 14-candle gas, with an improved burner, will give the consumer as good results as enriched gas with an inferior burner, such as is now in common use, is it not best for the consumer that the 14-candle gas should be supplied?—I think so; but there is more to be said about it than that. There is a question of the initial price of the improved burner, the stability of mantles, &c. The old-fashioned method of enriching was by cannel gas; the modern plan is by using carburetted water gas. The three present Gas Referees are chemists.

Counsel was proceeding to cross-examine witness with regard to the qualifications of the Referees, when

The CHAIRMAN informed him that he was not entitled to inquire further on the point.

Mr. DANCKWERTS said that, by the Acts under which the Referees were appointed, it was the duty of the Board of Trade to select three competent and impartial persons, one at least of them having practical knowledge and experience in the manufacture of gas. He wanted to call attention to the fact that the Board of Trade had continuously honoured that enactment in the breach.

The CHAIRMAN: That is entirely a question for the Board of Trade.

Mr. DANCKWERTS: It is one of the difficulties the Companies have to labour under.

By Mr. NICOL: It was quite impossible for the Companies to supply 16-candle gas from ordinary coal. The Companies adopted petroleum for enrichment purposes because of its cheapness; and gas so enriched lost its illuminating power as it travelled along.

Mr. DANCKWERTS: Cannel coal, I may say, is worked out. There is none.

The CHAIRMAN: I know places where it is being got now.

Mr. DANCKWERTS: The supply is so limited that you cannot obtain any quantity.

Dr. *Frank Clowes*, examined by Mr. TALBOT.

Witness said he had been Chief Chemist and Superintendent Gas Examiner to the London County Council since 1897, when he succeeded Mr. Dibdin. He considered the present system of testing at fixed stations insufficient. It did not afford any satisfactory indication of the quality of the gas supplied over the County of London; and certainly it did not guarantee a uniform supply. He continued, on attaining to his present position, the work in which Mr. Dibdin had been engaged; and he also agreed, without having had knowledge of testing by the portable photometer, to undertake that work also. In stations, the result of the work had been, generally, to show that the gas furnished had been of the standard power, or even slightly above it; but his experience with the portable photometer, in by far the majority of the tests outside the fixed stations, showed that, not only was the gas below 16-candle power, but below 15·5 candles—the limit not implying forfeiture. The tests were all according to the requirements of the Referees, and were almost invariably at places where the consumption was large. Taking the tests over the whole district, there was a constant depreciation in the gas. The falling off in quality shown by the portable photometer had gradually increased. Out of a total of 162 tests, 82½ per cent. were below 16 candles. Taking the whole results for the year 1899, the total number of tests was 200, of which 90 per cent. were below 16 candles, and 88 per cent. below 15·5 candles.

By Mr. NICOL: There were twenty fixed testing stations in the County of London.

By the CHAIRMAN: The South Metropolitan Company in 1899 stood in regard to tests in a very different position from the Gaslight and Coke Company. In that year, the number of tests of the South Metropolitan gas above 16 candles, or between 15·5 and 16 candles, were none; between 15 and 15·5 candles, 5, or 11 per cent. of the total number of tests; between 14 and 15 candles, 22, or 50 per cent.; between 13 and 14 candles, 15, or 33 per cent.; between 12 and 13 candles, 3, or 6 per cent.

Examination continued: At the same time that they were making these tests at various places, they were also comparing the results with those of the official tests; and he did not remember a case where the gas was found, officially, to be below 15·5 candles. The portable photometer, when worked beside the fixed instrument at the testing-station, gave the same results as the fixed instrument. A number of gentlemen who would be called as witnesses had the previous night been given experience in regard to testing. An ordinary fixed station was selected; and, at three board schools in the near neighbourhood, between the station and the gas-works, portable photometers were stationed. The fixed station was at No. 99, Blackfriars Road, in the South Metropolitan Company's area; and the Examiner gave notice that he would make the official test not before 6.45. The instrument was prepared in the usual way; and at 6.30 the test was made—the result being to indicate gas of 14·9-candle power. At 6.50—five minutes after the official time for testing—the illuminating power was 16·4 candles. The party then went to the board schools, where the portable photometers were used, and returned to the fixed station, where, at 9.15, a test gave 15·9 candles, and another, at 9.30, 17 candles. The report which witness had received from the Gas Examiner (not of the whole tests, but of the earlier ones) showed 16·4 candles. Going to the board schools, the first visited was that at Marlborough Street, where, at 7.15, the test showed 13·9 candles. At that test, the room was closed, and, in his opinion, in the most suitable condition for testing. As some suggestion was made that draughts might seriously upset the reading of the instrument, all doors and windows were opened; and ten minutes after, the other test—when there was a sort of hurricane blowing, the party having to put on their overcoats and hats, and turn up their collars—showed 14 candles. At 7.35, at Pocock Street School Room, the test gave 14·8-candle power. He explained that by "test," he meant a series of which the average was taken. At Holland Street, at 8.0, the test showed 14·2 candles; and another in the same room, but with all the windows and doors open, gave 14·6 candles. These figures he could personally vouch for. Between the 19th and 24th ult., experiments were made with regard to the statement that gas lost in illuminating power as it travelled from the works. They selected Brixton Road—that being, according to the best information they could obtain, supplied by one continuous main of the South Metropolitan Company. The first test made was at Hackford Road School, 1 mile from the works, and 0·2 mile from the main; the second, at Stockwell Road Board School, 2 miles from the works, and ¼ mile from the main; the third, at New Park Road Board School, 3 miles from the works, and quite close to the main; and the fourth at Edgington Road Board School, 5 miles from the works. Tests were made each day; and the averages were as follows: Hackford Road, 12·5 candles; Stockwell Road, 13·3 candles; New Park Road, 13·8 candles; and Edgington Road, 13·8 candles. Therefore, according to these tests, the gas did not depreciate in travelling 5 miles.

The CHAIRMAN: Can you give us the tests taken at the station at the same dates. This is worth nothing——

Mr. BALFOUR BROWNE: And it can be worth nothing, because these gases came from entirely different works.

Mr. TALBOT: That is one of the difficulties we have with regard to the whole subject—there is no reason why the official testing gases should come from different works.

The CHAIRMAN: Can we get to know from what works the gas was supplied in this main road on these days and hours, and the result at the testing-station where the test was applied to the same gas?

Mr. BALFOUR BROWNE: I am told the Company cannot tell you, and do not know.

*Witness:* I can say what the station test was. There was no forfeiture attached; so that it was over the standard. Continuing, witness said in some cases they had had 12 or 13 candle gas almost under the walls of the producing works, and immediately round the fixed testing-station, and then had 16-candle gas at the extremity of the district. It was this sort of result which had led the County Council to promote the Bill. Stations were sometimes closed for considerable periods. One, with the consent of the County Council, was closed in June last, and not opened again till March 29. There might be explanations; but he held it to be desirable there should be some method of testing to supplement a closed station. The method suggested in the Bill would enable the consumer to have tests made. Under the proposed condition—viz., that the Gas Referees should make themselves responsible for the methods to be used—there would be absolute fairness. The County Council did not say the testing-stations should be largely increased if the portable photometer were adopted.

Cross-examined by Mr. BALFOUR BROWNE: The Bill did not propose to supersede fixed stations altogether. The suggestion was that they should serve as centres; and that in each there should be a photometer of the new description.

Mr. BALFOUR BROWNE: Do the tests you have made, to your mind, show that the Companies have been fraudulently manipulating the gas?

*Witness:* I make no allegations. They are facts.

I want to know what inference you draw?—I draw no inference.

What inference are the Committee to draw?—The Committee will draw their own inference.

I concede two things—that if the gas was sent out of the works of the right illuminating power, it may either depreciate by something between the works and your test, or that you might suggest that the test at the works or near the works was fraudulently got. Which are you suggesting?—Our tests I am prepared to stand by.

Are the tests at the testing-places also accurate?—Yes.

I want to know the different circumstances to account for that?—I cannot account for it. On it being suggested that if the gas were exposed in a small pipe to cold that would make a difference, witness said he was not prepared with any explanation.

Do we understand that the present system of testing is, in your view, entirely illusory?—I am quite sure that the gas consumers round the testing-stations are not usually getting the gas which the station is furnished with at the time the official test is made. The portable photometers and the other testing photometer were said by the Gas Referees to be both accurate.

Cross-examined by Mr. DANCKWERTS: The results of the tests were much more in favour of the Gaslight and Coke Company than of the South Metropolitan Company. His position was that of Superintending Gas Examiner; but he could indicate no Act under which his appointment was directed to be made. He agreed that the Examiners had to be impartial persons. He could not give the number of times the Gaslight and Coke Company's gas had been found deficient at the fixed testing-stations. It was put to him that in five years there were only sixteen such occasions; appeals being lodged in each. The result was that two only were sustained. Witness said it was quite possible; but he did not know.

Mr. DANCKWERTS: Do you suggest that the gas which is supplied to the testing-stations is a different gas from that supplied to the places where you test with your travelling photometer?

*Witness:* I have absolutely no knowledge.

Is it possible?—I cannot say what the Companies do.

Supposing your testings are what you say they are, and supposing the official testings of gas are what they are, what causes for the difference can you suggest beyond these: (1) that a better gas is supplied to the testing stations than is supplied to the rest of the district; (2) that there are some local conditions which vitiate the test; and (3) that there is something wrong with your travelling photometer and the conditions under which it is used. Is there any fourth suggestion you can make?—I have no suggestion to make.

You are a practical man. Is there any fourth way of accounting for the difference?—I am not prepared to account for it.

Supposing those are the only three possible things you can consider, does it not occur to you that it is very likely something takes place between the main and your photometer, which affects the quality of the gas, or that the conditions under which your travelling photometer tests the gas do not give real results?—I am quite prepared to say the portable tests are as accurate as any photometer tests can be.

Further cross-examined: In one case, whether there was a hurricane or not made no difference to the tests. Asked to account for this, witness said again he could only report the facts. It being suggested that, with this delicate instrument, if once the conditions necessary to get an accurate test were disturbed, it did not matter how much the conditions were worsened, witness said the results he reported were arrived at with the greatest possible care. The test made with the "traveller" was with gas which had come through a service-pipe. He had made no application to the Company for permission to test gas from the mains direct.

Mr. DANCKWERTS said he suggested that the whole of the experiments witness had made with the travelling photometer were vitiated by the fact that the gas tested was not gas as it existed in the mains, but after it had passed through a consumer's pipes.

Mr. RIGG then put a number of questions to witness, with the view of showing that the Bill would give the County Council powers in the City, and as to the conditions in the City; but witness said he knew little or nothing about the City. He was prepared to maintain that very often the best gas might be the cheapest. He knew there were 7000 gas-engines in London—1500 of them in the City alone.

The CHAIRMAN, replying to a question by Mr. Danckwerts, said that the authorities had the power to test *ad libitum*.

Mr. POPE remarked that the Companies had the right to be present at the tests, if they chose, and to know where they were to take place. If they intended to be present, the Companies could insist on having notice given.

The CHAIRMAN: Notice is only given when the Company require it?

Mr. DANCKWERTS: That is so.

Mr. TALBOT said there was no intention in the Bill to give the County Council power to examine gas in the City, as was shown by clause 5. But if clause 5 was not sufficient, it should be altered, or a proviso should be inserted to show that the County Council did not mean to trench upon the domain of the Corporation. But the Bill was only permissive in that respect. It would not hurt the Corporation to say that the County Council Examiners should have power to examine the gas in the City whenever the Corporation chose to allow them.

In reply to Mr. NICOL, witness said he was largely responsible for the preparation of the Bill. As to the discrepancy which had been found to exist between the results of the testings at the fixed stations and those with the portable photometer, he said he had not been prepared to find it. The discrepancy was found by all the Examiners, and it was pretty usual to discover it.

Mr. NICOL: In your report to the County Council, you did not make any comment on that?

*Witness:* Absolutely none.

Should not you have done so?—The only suggestion I made was that evidently the testing at the fixed stations did not ensure to the consumers gas of 16-candle power.

How can you account for the same kind of instrument at the two classes of testings giving different records?—Because, as I say, the consumer is not receiving gas similar to that burning at the fixed testing-station.

Can you give no other reason?—I gave the Council no reason; and I wish to give the Committee no reason. I think the Committee should form their own conclusion.

There is running through this evidence nothing certain, but an amount of, I will not call it insinuation, but construction thrown on it, that for some reason or other different gas is sent over the areas you tested to that sent into the fixed testing-stations; the latter giving the same results as regards illuminating power, whether tested by the photometer of the fixed station sanctioned by the Referees or by your portable photometer?—The results at the fixed station are given as the outcome of statutory requirements. Other tests have been made; and it seems to me desirable that a Parliamentary Committee should know the result of them. I have stated what the results are; and there I leave it.

Do you suggest that the gas tested at the board schools is different gas to that tested at the fixed stations?—I do not suggest anything. I do not know anything. I am told that I am wrong when I venture an opinion as to underground mains; and I cannot pretend to have any knowledge as to underground gas.

Then you only came here to speak as to the accuracy of the figures you have given us?—That is all.

Mr. STANLEY LEIGHTON: The Companies say they are not bound to give the same gas at the testing-stations as they do to the public.

*Witness:* I believe they say so.

By the CHAIRMAN: He thought the discrepancy in the quality of the gas as shown by the two testings was greater now than it was in the time of his predecessor.

The CHAIRMAN: The portable photometer used in former tests, which, on comparison, you find to give the same results as the official photometer, is the one you have used in recent investigations at the board schools?

*Witness:* Yes; it has been in use with others. I took one over from Mr. Dibdin; and we have had three more made.

It is the same class of machine?—Yes.

Equally reliable?—Yes. We have used two of the old bar type, and two of the table type.

Do you concur with the evidence of the previous witness that the atmospheric conditions in the room in which the test is conducted, and the temperature, would not be likely to affect your peripatetic photometer?—Yes. The temperature we can correct; and the atmosphere in the room would not vitiate the test, I should think.

Then you maintain that, for practical purposes, the tests you have made at different times in the board schools and other public buildings have been conducted under as safe and secure conditions as those made at the fixed testing-stations?—I quite maintain that.

That is to say, the difference in conditions as to draughts and atmosphere would be infinitesimal in their influence on your tests?—I should think so.

We had it from the last witness that rich gas might be impoverished during its progress from the centre of production to the centre of the supply area. Do you agree with that?—I can form an opinion on that as an outsider; and I have conferred with those who know. They have told me that they have known gas to travel 6 miles through the pipes without any loss of illuminating power. I must leave it to others to give the Committee the details.

The CHAIRMAN asked whether, that being so, witness could explain the phenomenon spoken to—that in a certain case the gas rose in illuminating value as it progressed from the works.

*Witness* said he could not explain it.

[During the evening the Committee availed themselves of an opportunity afforded by the parties to inspect the gas-testing appliances spoken to by the witnesses. The photometer was put up in one of the apartments of the House.]

**Friday, April 6.**

Mr. TALBOT handed in figures of testings at the official testing-stations in the Brixton Road and Blackfriars Road, corresponding to the times at which the peripatetic tests referred to by Dr. Clowes were taken.

Dr. *Clowes* re-called.

Witness explained a cartoon giving a rough diagrammatic representation of the tables furnished to the Committee the previous day. The cartoon showed the various producing works, the testing-stations, the places where tests made by the portable photometer satisfied the statutory requirement, and other places (indicated by red dots) where the tests were below 16 candles. The red dots, however, did not all represent cases where a forfeiture would have been exacted from the Companies; about 2 per cent. represented tests between 16 and 15·5 candles, which were not subject to forfeiture. He pointed out that the red dots were generally pretty close to the testing-stations and the works of the Companies, and not by any means unfairly chosen by being on the confines of the gas districts.

Mr. *Otto Hehner*, examined by Mr. WORSLEY TAYLOR.

Witness said he was one of the Gas Examiners originally appointed by the Board of Works, and subsequently by the London County Council. He had made frequent use of the apparatus prescribed by the Gas Referees, and subsequently of the portable photometer. They were identical instruments, and gave identical results. He was clearly of opinion that, with the portable photometer, under reasonable circumstances, accurate results could be obtained. He had read the photometer under ordinary conditions, in a whitewashed school room, and then with black boards put up so that there should be no influx of light from the outside; and he found these conditions made no difference. He had also made experiments with the instrument in a room in the ordinary way, and then after the doors and windows had been opened; and the results were practically the same.

The CHAIRMAN: What do you mean by "practically"?

*Witness:* In one experiment, I found two-tenths of a candle less.

Further examined by Mr. WORSLEY TAYLOR: Under conditions in which a fair-minded man of experience would use it, the portable photometer was to be relied on to give a trustworthy test—just as much as any station.

Mr. WORSLEY TAYLOR: Does gas lose seriously in passing a considerable distance through mains?

*Witness:* I have made some tests in that direction in North London on the mains of the Gaslight and Coke Company, and in South London on the mains of the South Metropolitan Company; and I found no material loss. I have, if anything, found a small gain, but within the limits of experimental error, when following a main for 5 miles.

You found no loss in following a main 5 miles?—No. If anything, there was a small gain. One evening, starting with the mains not far from Kennington, I found 13·4 candles, and tracing the main as near as I could to Streatham (about 5 miles distant), I found 13·6 candles, which was practically the same result.

The CHAIRMAN: How did you get to these mains?

*Witness:* By photometers fixed up in board schools, following as near as we could the main, and taking gas presumably from the same main.

Mr. WORSLEY TAYLOR: Do you say that the conditions for testing secure to the public uniformity in illuminating power?

*Witness:* From recent experience I have had, I think they do not. I formerly thought they did.

So that, in your view, assuming that the object be to protect the consumers, some fresh legislation of some kind or other is necessary?—It is. I have also made experiments in conducting gas through 200 feet of $\frac{3}{8}$-inch pipe. I found that there was no difference between the gas so conducted and that carried through a larger pipe; but when I immersed the 200 feet of pipe in ice, it did make a difference. The illuminating power fell from 16·8 to 16 candles. With the ice, I froze some of the illuminant out of the gas.

The CHAIRMAN: Was the whole of the 200 feet of pipe in the ice?

*Witness:* Yes; in the shape of a coil. I also made an experiment by passing gas through ordinary gas-meters, to see if it loses anything. I tried both wet and dry meters. I found it made no difference whatever, whether the gas was taken into a dry house-meter or a wet. I afterwards put an additional wet meter to the photometer, so that the gas passed through three meters—the dry house-meter, the photometer meter, and this additional wet meter. It made no difference whatever.

Mr. WORSLEY TAYLOR: What meter did you use—a new one containing fresh water?

*Witness:* No; one which had been used before. If the meter was freshly filled with water, it would make a difference; and if a perfectly new dry meter were used, it would go against the Company.

By the CHAIRMAN: As to the freshness of the water in a wet meter, the question was one of saturation of the water with the gas.

Mr. WORSLEY TAYLOR: Of course, all possible sources of error are perfectly well known to yourself, and to everybody else equally conversant with gas testing?

*Witness:* Yes. If it were known that a new meter had been fixed at a certain house, it would be unfair to pass the gas through it for testing purposes.

And, as a fair man, you would be careful to eliminate all sources of error?—Certainly. I should inquire myself as to when the meter was put up, and as to the pipes. I should see that the pipes did not go too far over ground, and that they were not immersed in ice.

The CHAIRMAN: If you were going to new premises, you would do that?

*Witness:* Yes.

If you were going to a board school where you had been before, and the conditions were the same as before, you would feel no hesitation in making the test?—That is so.

Mr. WORSLEY TAYLOR: Do you think it right that security should be taken against errors?

*Witness:* Yes; I think so.

You said you had followed as well as you could the gas from the works to the testing-station?—Yes.

Give us the result?—I made an experiment on April 3. I followed out as nearly as I could the flow of the gas from the Bankside works of the South Metropolitan Company. I did not go alone, but was accompanied by Dr. Frankland, Messrs. Grimwood, senior and junior, and Mr. Dibdin—

all experienced Gas Examiners. I took the first test at 7 o'clock, at the Marlborough Street Board School. We had a portable photometer of the bar type; and we found that the gas was of 14·2-candle power.

What sort of room was it?—A nice board school room, fairly high, with good air in it, and no unreasonable draught.

Do you know when the room had been last used?—I do not. It was about ½ of a mile from the Bankside works.

Where did you get your gas from?—From a pendant in the room, joined with metal tubing. It is known that india-rubber, especially if new, absorbs some of the illuminating power of the gas.

What did you do next?—I went to the official testing-station close by—No. 99, Blackfriars Road. We made a test there at about 7.25, or a few minutes later. There we found the gas had an illuminating power of 11·3 candles. The testing-station was fitted up in accordance with the Gas Examiner's requirements. We all took readings. The flame which was burning was quite small. Anybody without a photometer could see that the gas was vastly deficient in illuminating power. Continuing, witness said the illuminating power was extraordinarily bad; he never saw anything like it. They naturally, therefore, made a further test. An official test was due about 8 o'clock; and while waiting till then, the illuminating power increased. At 8.8, when the test was made, the illuminating power was 15·82 candles. This was the figure of the official Examiner—witness being behind him, and checking his readings of the photometer, so that he knew they were correct. To make quite sure, witness then tested the meter and clocks, and found that the meter registered correctly, or within ¼ per cent., which was nearer than was necessary under the regulations of the Gas Referees. The party then went to the Holland Street Board Schools, which were in the shadow of the Bankside gas-works; and there, at 8.55, the reading was 15·8 candles—practically the same as at 8 o'clock. Thence the party went to Pocock Street Board Schools, which were within a stone's throw of the testing-station at No. 99, Blackfriars Road. A test with a bar photometer was made at 9.20, which gave 14·6-candle power; and another, made after the doors and windows had all been opened, showed 14·4 candles. On returning to the official testing-place at No. 99, Blackfriars Road, at 9.45, the gas looked very feeble, and gave 15·2 candle power. The gas between 9.45 and 10.10 underwent a remarkable change. At 10.10, the official test—checked by Professor Frankland and witness—gave 17·3 candles; and another, at 10.25, gave 17·6 candles. The latter was an independent test, made with the official instrument.

The CHAIRMAN: All these places are close to the producing works?

*Witness:* Yes.

Examination continued: In witness's opinion, further measures in regard to testing were necessary. The testing provided for in the Bill, if the conditions were fair, and if the testing was done at reasonable places, was proper to ensure that the public obtained 16-candle gas, or something approaching it.

Cross-examined by Mr. BAGGALLAY: There must be some check on the Companies. The question of a surprise visit should have nothing to do with the matter. If a gas company bargained to supply 16-candle gas, they should do so without notice being given of an intention to test. He agreed that there was a limit in the choice of places at which testings should take place, and that conditions should be observed as to the time and the pipes through which the gas was conveyed to the buildings. In ordinary circumstances, the meter would not materially affect the illuminating power of gas passed through it, as distinguished from the gas in the main before it passed through the meter.

Mr. BAGGALLAY: What is your suggestion with regard to the irregularities found to exist between the testings at the places where the portable photometer has been tried, and the testings in the stations?

*Witness:* I have the greatest difficulty in explaining them to my own mind, but they were fairly obtained. Possibly the gas did not come from the same main, though we tried to obtain it as far as we could from the same main.

Is it your suggestion that the Companies have separate mains to take the gas to a testing-place, but from which they do not supply gas to the consumers?—I do not know.

That is rather suggesting something. However, you have no evidence?—I have no evidence.

Unless there is something of that sort to explain it, you are unable to account for it at all?—I think Counsel can draw their own conclusions as well as I can.

I ask you straight, Mr. Hehner, do you, or do you do not, suggest fraud on the part of the Companies?—Not in the least.

Do you, in this particular instance which you have been going into in the Blackfriars Road, suggest any fraud?—Not in the least. I take it that the Gas Companies really say to themselves: "We are obliged to supply at the testing-stations 16-candle gas"—and they do.

Mr. POPE: That is a proposition I assent to at once.

*Witness:* I believe these gentlemen to be perfectly honourable. I suggest a reading of the Act of Parliament which does not commend itself to me; and I do not think it is a fair reading. They say: "We bargained to supply at the testing-station 16-candle gas; and we do it."

Mr. BAGGALLAY: Actually, in the one station, tested with the same apparatus, under the same conditions, there was a great difference of the readings in a very short period of time?

*Witness:* Yes; there were 6 or 7 candles difference.

If you are not suggesting fraud, or if there is no suggestion of fraud, how could this possibly happen, unless it was due to accident?—Of course, it might be due to accident.

If it is not due to accident, must it not be due to fraud?—It is a question of fact, checked by myself and five competent colleagues. I have no conclusion whatever to form.

On the question being repeated that, if the difference in the results obtained in that short period was not due to accident must it not be due to fraud, witness was understood to reply that he would not and could not answer the question.

Cross-examined by Lord R. CECIL (who remarked that these facts had come as a great surprise to the South Metropolitan Company), witness said the test at 8.8 gave 15·82 candles; at 9.45, 15·2 candles; and at 10.10, 17·3 candles.

Lord R. CECIL: Do you, or do you not, intend the Committee to draw from that the conclusion that a change was made in view of the official test about to take place.

*Witness:* There was a change between 7.25 and 8.8 which was visible, not only on the delicate instrument, but to the naked eye of all——

I wish to know exactly the case that the Company have to meet. Is it your suggestion that this was done intentionally and deliberately by the Company?—I do not know.

Is that your suggestion?—I suggest nothing.

Has your evidence any relevancy to the inquiry, unless that is so?—I give the facts; and I give them as unbiassed as I can.

The CHAIRMAN: He has stated the fact.

Mr. POPE: It does seem to me to be of very great importance. You say that these tests are unsatisfactory, and that a change should be made to some extent in the system of testing, so as to arrive at a satisfactory result. The facts are very important, and we ought to consider them, and deal with them as best we may. Probably we shall be able to deal with them after the recess better than we can now, because we shall have made experiments of our own to ascertain what the actual facts are. But it is important we should know whether the inference which the skilled witness draws is that there was a change made in the gas pending the test at that testing-station, because it might turn out that such a suggestion is impossible. I do not know. If it were impossible, we might satisfy you that it was impossible. It does seem to me that, if this means anything, it means that, wilfully or accidentally, a change was made in the gas pending the official test at the station.

*Witness:* A change was certainly taking place in the gas.

The CHAIRMAN: I think I must rule that the witness is a skilled witness—that he is skilled in the demonstration made by the gas when it comes out of the pipe. But he finishes with the burner; he does not go down to the main. He has nothing to do with the sources of supply.

Mr. POPE: I quite agree that his investigations have nothing to do with the sources of supply.

The CHAIRMAN: The witness has given the Committee the benefit of his investigation in testing the light. I do not think he can be expected to go beyond that.

Mr. POPE: I do not think he could complete his statement by saying: "I have seen, and know, that the mains are so and so; and the thing can be done." That is a different matter. But I should like to know whether, in his mind as a skilled witness, any other explanation is possible.

The CHAIRMAN: I think it is quite competent to ask the witness what conditions, in his judgment, may possibly have caused this change.

Mr. POPE: Yes.

The CHAIRMAN: But to go as far as the motives——

Lord R. CECIL: I did not wish to go to motives.

The CHAIRMAN: I think your question does go to motive. You raised the question of fraud. Of course, motives are involved.

Lord R. CECIL: I think I did not use the expression fraud; and I certainly did not intend to do so. My point is: Does he suggest, with his knowledge of gas manufacture, that this was done purposely—that this was the act of the Company?

*Witness:* I cannot say in the least. I was there, and watched the flames, and saw a great change.

Can you suggest to the Committee any way in which it could have happened?—No; it may have been an accident. Continuing, witness conceded that draught, temperature, and the presence of air in the pipes might affect the illuminating power. A leak, in theory, might admit air to a main; but practically, when a leak occurred, the gas escaped, and no air entered.

Re-examined by Mr. WORSLEY-TAYLOR: In his view, there should be conditions with regard to the control of the Gas Referees, as to apparatus, the mode of taking the tests, and prescribing a certain reasonable class of places, so as to exclude parts where there were dead-ends, and so on. If a Company thought a particular test, even made under the conditions laid down by the Gas Referees, was unfair, there would be an appeal, under section 12 of the Act of 1880, to the Chief Gas Examiner; so that there would be double security.

The CHAIRMAN said he had made a note on the Bill that the promoters were prepared to give security that a class of places evidently improper should not be included. (To witness:) Are you prepared to give the Committee your idea of the cause of the changes you have observed in the testings?

*Witness:* I do not know what the causes were.

Do you think it possible or probable the change arose from a momentary deflection from the correct attitude, so to speak, of your instrument?—I think not. It was not a momentary observation, but the volume of flame could be seen to be altogether deficient; and the rise in the illuminating power took place quite suddenly.

Your experiment was made on the 3rd of April?—Yes.

On what other occasions have you observed so great a rise and fall?—Well, I have not been a Gas Examiner for some years now. When I was in practice, I found the gas of excellent quality from an illuminating point of view.

Might it have been caused by some incident at the manufactory?—I cannot conceive that.

Would you conceive it possible that, by any intentional act on the part of the Company, they would give a supply of gas of the quality of 11·3 candles at a testing-station, to be followed in a quarter of an hour or twenty minutes by a supply of 17·3-candle power?—I think so.

You think that could be managed?—Yes.

Your practical experience enables you to suggest that, with sufficient *mala fides*, you could produce such a result?—If you asked me to do it, I could.

Lord R. CECIL: You said you did not know how it was done.

*Witness:* And I do not know. But now I am asked whether I could bring about such a result; and I say I could.

Mr. WORSLEY TAYLOR: My learned friend Lord Robert Cecil asks witness if he knows how the Company could do it; and he says he does not. If anything is to turn on this hereafter, I should like the witness to have the matter clearly before his mind.

The CHAIRMAN said he had not regarded the witness's statement in the light of indicating how the Company could bring about the change which had been referred to.

Lord R. CECIL: If there is a charge brought against us——

Mr. WORSLEY TAYLOR: There is no charge.

Lord R. CECIL: Not specifically; but if there is an implied charge, it is

desirable that we should have the view of the witness put plainly before the Committee. (To witness:) Do you know how it would be possible for the Company to change the quality of the gas from 11 to 17 candles in the course of an hour?

*Witness:* I do not know; but I was asked whether I could do it, and I replied that I could. That is a question as to my being able to conduct an experiment; but when you ask me whether the Company have done that, my answer is I do not know.

Witness was pressed by the learned Counsel on this point, as to his view of the means by which the discrepancy had been brought about; but he said it was possible, although he did not know how it had really occurred. Witness asked the learned Counsel to put a concrete case. He wanted the question put in such a way that he could answer it.

Lord R. Cecil: I admire your caution. Take this hypothesis. I supply ordinarily at this testing-station gas of 11-candle power?

*Witness:* Yes.

At 7.30, I supply gas of that power. I know that the Gas Examiners are coming at 8 o'clock to make a test at that station. I desire to continue to supply gas of 11-candle power up to 7.30, and at 8 o'clock to supply gas of 16-candle power. Tell me how I can do it?—I should say this. Pass the gas through pentane; then you can get 10 or 11 or even 20-candle power.

Where should I pass the gas through pentane?—Anywhere before it reaches the photometer.

It could not be done, I presume, at the works themselves?—I do not know.

If I did it, then, at the works themselves, how could I be certain that the gas would reach the testing-station at the proper time?—I do not know; but I should say that, by putting a particular pressure on, you could make the gas reach a particular place at a particular time.

How would you do that?—I do not think I should do it at all. If I were asked, I should decline the job, and should leave the Company to do it on their own account.

Lord R. Cecil: Well, I have done my best to get an answer to this question; and I am sorry I have failed. I must leave the matter there.

The Chairman (to witness): I understood you to say to me that, with the limited practical knowledge you have of gas manufacture, you could, if necessary, produce gas of 11·3-candle power, and then in another hour produce it of 16 or 17 candle power?

*Witness:* Yes.

In order to do that, you would simply alter your process of manufacture—you would put your enrichment in at the hour you wanted the higher illuminant?—Yes.

That is a simple proposition, is it not?—By the increase or decrease of enrichment, you can alter the quality of the gas produced at a given time.

It is the intention of the Act of Parliament, according to your interpretation, that enrichment should take place?—Yes.

The gas could not be maintained at 16-candle power without that?—That is so.

And therefore this artifice of enriching, to maintain equal quality, should be persistently continued from day to day, and from hour to hour?—Yes.

And if you wished to secure an extra profit on your trade, you would make the condition of the gas fluctuate from time to time?—Yes.

Having that power of manipulation in your hands, could you so manipulate that you could produce the desired result for the deception of an inspector at a given hour at a given station?—I am not sufficiently practical to be able to speak with certainty as to what a manufacturer could do; but personally I do not think there would be any difficulty.

When there is a certain amount of consumption going on, and you know the speed at which the gas from your works travels to the stations, you would be able to calculate, within a reasonable limit of time, as to when you could produce these results?—I think so, although, as I say, I am not a practical gas engineer.

That is the line of action, however, that you are contemplating in your replies to my questions?—Yes.

Lord R. Cecil: This is very important to us; and I would ask to be allowed to follow it up. (To witness:) You suggest that this alteration takes place at the works?

*Witness:* No; I understood that a hypothetical case was put to me how the thing could be done.

And you think that an alteration from 11-candle power to 17-candle power could take place at the works?—I think it could.

Do you think it might also have been done by the manipulation of the gas in the pipes at the testing-station?—It is possible.

It might have been done practically at every one of these places?—I should think so.

The Chairman: There is no suggestion, I take it, that there has been any manipulation of the gas proceeding from the main for the purpose of examination?

Lord R. Cecil: I do not know.

The Chairman: I have not heard anything of the kind from witness.

*Witness:* I have not made any such suggestion. I have only given evidence as to the facts which actually came to my knowledge.

The Chairman: The witness makes no suggestion as to what was the originating cause of the variation of illuminating power in this specific case. I took him away from that subject to his limited experience as a gas manufacturer and chemist, and so on, and asked him, with his limited knowledge, whether he could say that any manipulation could take place to produce that result. He says it could.

Lord R. Cecil: And I want to ask you, in order to meet that charge——

The Chairman: There is no charge.

Lord R. Cecil: Then we want to meet the suspicion of the statement. We say nothing more than that; and we want to know from the witness exactly where he thinks this alteration could have been brought about—whether at the works, at the testing-place, in the mains, or where.

The Chairman: I think his answers all centred in the manipulation taking place at the works.

Lord R. Cecil: I want to get that clear, and whether he suggests that it could take place at the testing-stations.

*Witness:* I would tell you how it takes place, if I knew; but I do not know. I give you the facts that I have discovered.

We leave the facts you have discovered, and deal with you as a gas manufacturer. Do you tell me that the variation from 11-candle power to 14, 15, or 16 candle power can be produced in process of manufacture?—I think so.

And the difference can be sharply produced from one period of time to another?—I believe so; but I do not know.

And from the knowledge you would derive from inquiry as to the speed at which gas travels through the mains, you think you would be able to make the alteration in the quality of your production at the time that would just meet the requirements of the test?—Yes.

The Chairman: There is no allegation that such a thing took place. I would go farther, and say there is no insinuation of it.

Mr. Worsley Taylor: We say, in the preamble of the Bill: "And whereas it has been found that the illuminating power of the gas supplied by the said Companies in their districts generally, cannot be satisfactorily or sufficiently tested by tests made only at certain prescribed testing-places; and whereas it is desirable that powers should be given to the Gas Examiners to make additional tests of the illuminating power of gas elsewhere in the districts of the said Companies, in manner to be prescribed by the Gas Examiners;" and so on.

Lord R. Cecil: Do you think such alteration could have taken place at the gas-works, or partly at the works and partly by manipulation of the pipes at the testing-station, or wholly by that manipulation? Do you know of any practical manner by which it could be manipulated at the testing-station?

*Witness:* If you asked me to do it, I think I could.

Could you advise means of doing this which would elude the vigilance of people coming to inspect?—I have not made the experiment.

Mr. Worsley Taylor: All the witness comes to state is that there has been a variation at the testing-station. He comes to give the results of his experiments.

The Chairman: I do not think this important, as he is giving evidence from the limited basis of partial knowledge of gas manufacture.

Lord R. Cecil: You were dealing with a new photometer; and that at Blackfriars Road is a new one?

*Witness:* Yes; the reading of the new photometer is undoubtedly sharper than the old one. But I think that half-a-candle power will fully meet the difference.

Mr. *B. H. Gerrans*, examined by Mr. Bernard Wilkinson.

Witness said he was a Gas Examiner of five years' experience under the London County Council, at the Blackfriars Road station of the South Metropolitan Company. He described the duties of a Gas Examiner, and the method of making tests.

Mr. Wilkinson: It is possible, is it not, to judge of the candle power of gas merely by eyesight?

*Witness:* Approximately. In the series of three tests we have to make, the first very often is slightly below 16-candle power, and the two subsequent ones are above it. I have noticed the variation in the results. One may be high, and another may be low. They do not all show the same result, though the average may be 16-candle power. Between the taking of the official tests, I have seen the volume of the gas both increase and decrease. On April 3, I had to make two tests—one at 8 o'clock at night, and the other at 10 o'clock—and a third at 8.45 on the morning of April 4. The test at 8 o'clock showed 15·391-candle power. Between the 8 and 10 o'clock tests, I measured the height of the flame. At 9.15, it was 2¼ inches, at 9.25 2⅞ inches, and at 9.55 2¾ inches. The second test was taken at 10.10; and the candle power was 16·723. I made no further measurements; and the next test was an official one at 8.45 in the morning, when the candle power was 15·876, uncorrected. The corrected average for the legal day was 16·5 candles. Judging by my observations with the eye, and the measurements I took between 8 and 10 o'clock, it was clear to me that the flame decreased in height between the two official tests. It is my experience that when I remain at the station between two official testing hours, the flame decreases. I have noticed it before. I should not say that the decrease I noted on the day I have mentioned was an average occurrence; but I have noticed such a decrease before.

Cross-examined by Mr. Pope: He did not admit that the tests were left uncorrected to save himself trouble. The tests were made according to the printed instructions supplied to the Examiners. He did not act as he had done to scamp the work.

The Chairman (examining the Book of Instructions): The number I see is arrived at by the manipulation of the barometer and the thermometer indications at the time of the test; and a number is given to be used as a divisor. This is a method devised by the Official Referees to accelerate the work of the Examiners.

Mr. Pope: Is that the book of the County Council or the instructions of the Referees?

The Chairman: It is the County Council book—an abbreviated method of doing the same thing.

Mr. Pope: Yes; a method to save trouble. (To witness:) Did you make any other tests than by measuring by a piece of paper?

*Witness:* Yes; by general indications. I could see by the height of the flame on the glass that it was not as high as in the photometer.

Why did you not make the experiment with the photometer?—I had to use the instrument at my hand.

You had the photometer?—It was no part of my official work to make the test between the hours of 8 and 10 o'clock.

Re-examined by Mr. Worsley Taylor: His business was only to make official tests. Between the official tests, the gas-flame was burning; and when there was considerable variation in the height of that flame, and consequently variation in the candle power, he could distinguish the fact with the naked eye, without regard to the photometer.

By Mr. Stanley Leighton: The Gas Companies were entitled to have a representative present when the official tests were made. He could not account for the variations in the light. Possibly they were due to variations in the illuminating constituents of the gas.

By the Chairman: The fluctuations he had mentioned in the height of the flame were not the rule; but he had noticed variations before. Generally the gas kept fairly constant. On other occasions, he had taken photometric tests, apart from the observation of the eye; but they were unofficial, and he had kept no record of them.

The CHAIRMAN: Can you, by memory, give us some idea as to the divergence from the standard?

*Witness:* Speaking purely from memory, I have found 13-candle gas, and I have found 18-candle gas.

Have you ever found 11·3-candle power?—I do not remember a case.

Have the variations been sudden—coming within the range of a few minutes or hours?—They have varied. I have seen the flame come up within (say) five minutes, from being a low flame to a very high one, and I have known it go back again, sometimes, between my official tests.

Mr. NICOL: In your experience of five years, taking these tests, can you tell us roughly what the general average candle power has been?

*Witness:* The official average has been over 16—probably considerably over 16 candles. There had not been more than three or four times in the five years when the official average had been below 16-candle power.

Dr. *Percy F. Frankland*, F.R.S., was next called.

He said that for 20 years he had given a great deal of attention to the chemistry of illuminating gas, and was acquainted with the portable photometer. In his opinion, it was a trustworthy instrument, and capable of giving just as accurate results as the photometer ordinarily fixed at the testing-stations.

Mr. TALBOT: You are familiar with the objections stated against it? Do you think these objections afford any reason why the portable photometer should not be used?

*Witness:* No. I think that attention has been drawn too much to minutiæ which have been greatly exaggerated as to the effect they have on the result. As to draught, while I admit that a violent draught would have an appreciable effect, I believe that ordinary draughts—such as occur in rooms of the character of those in which these tests are made—have no effect whatever. There cannot be the slightest doubt that the tests made with the instrument are perfectly safe and reliable. I have made experiments as to the transmission of gas through mains. I assisted at the tests to which reference has been made in the course of this inquiry, and have followed the mains and made tests from them at intervals on the way; and the result is set forth in a schedule produced. On March 22, I made a test a mile away from the Vauxhall works of the South Metropolitan Company; and I found that at that distance the illuminating power of the gas did not decline, but rather rose.

Does gas lose by travelling?—The evidence is that there is no diminution of illuminating power as gas passes through the mains. Some companies carry their gas through miles of mains from the works, which they would not be likely to do if experience showed that there was a loss of illuminating power caused thereby. We heard yesterday that one Company—the Gaslight and Coke Company—carried their mains from the Beckton works to their supply district, a distance of 10 miles; and that there is no loss of illuminating power along that distance. I believe, indeed, that the Company who carry their gas the longest distance have the best results; but I do not know that of my own knowledge. All the results that were obtained in our series of experiments (extending from March 19 to March 24) showed that the gas was below 15 candles. I have made experiments to elucidate the point as to whether the gas supplied in the neighbourhood of the fixed testing-stations is of lower illuminating power than that at the testing-stations. I went with Mr. Hehner, Mr. Dibdin, and the two Mr. Grimwoods on the evening of the day on which Mr. Dibdin gave his evidence, and made tests at the places referred to by Mr. Hehner. I made examinations of the illuminating power of the gas at all the stations.

You were in the room and heard Mr. Hehner's evidence?—Yes; I followed it, and I can say that it is absolutely correct. I made observations which closely agreed with those stated by Mr. Hehner and the other gentlemen. By the observation of my own eye, I saw the phenomena he describes at the fixed testing-station.

Has the result of the experiments you made, and which you saw made, convinced you that the present system of gas-testing is insufficient?—That is the only conclusion that can be drawn. Not only does the present system not guarantee 16-candle gas within the district, but it does not give a guarantee of 16-candle gas within the testing-station.

It merely guarantees a supply of 16-candle gas at a particular time and a particular place?—Yes.

Now as to the effect on the illuminating power of gas by passing it through an ordinary domestic meter, wet or dry; what do you say as to that?—Passing gas through a new meter, wet or dry, is calculated to diminish its illuminating power; but my impression was that passing it through an old meter would have no effect. I therefore made experiments; and they confirmed that view. And here I must say that I plead guilty to having defrauded the Gas Company, in a small way, by having taken some of their gas from the main before it had passed through the meter. We attached a pipe to the supply pipe.

The CHAIRMAN: I suppose you detached the meter, intercepted the gas, and passed it through your apparatus?

*Witness:* No; we did not actually detach the meter, we put in a T-piece. We found that the illuminating power of the gas taken direct from the main was 16·7 candles; and that the gas passing through the dry meter also had a power of 16·7 candles. Subsequently, we passed the gas not only through the house meter (which was a dry one), but also through a wet meter, and the meter of the photometer, with the result that we got gas of the illuminating power of 16 candles. Some time, however, elapsed between that result and the 16·7 candles result. We switched off the wet meter; and again the result was 16 candles. Then we made experiments by passing gas through 65 yards of ¾-inch piping and there was no alteration in the result. Then we placed the coil of pipe in ice—reducing the temperature to 32° Fahr.; and we got the result which has been stated.

Mr. BALFOUR BROWNE (in cross-examination): How did you get the gas from the main.

*Witness:* We got it from a service-pipe off the main; but before it had passed through the meter.

Distance has no effect on the illuminating power?—That is so.

On what experiments do you rely for that statement?—So far as the tests I made along an exposed line of pipes in the South Metropolitan district were concerned, there was no alteration in the illuminating power. That was the specific result I got; and besides that, I have the general knowledge that it is the practice of the Gas Companies to carry their gas through long lengths of main.

You mean when the gas is passing in large quantities. You do not mean if the gas is passing through a long length of ¾-inch pipe?—No, but 65 yards of that makes no difference.

I suppose that naphthalene would be deposited at the temperature of 32° Fahr.?—Yes.

Naphthalene itself would absorb illuminating power, would it not?—Yes, to some extent.

Your experiments were only recently made?—Quite so.

Therefore they are not the reason for the promotion of this Bill?—No; the experiments were made in order to confirm results previously arrived at.

To confirm them in their good opinion of themselves. (Laughter.) You got a result of over 16 candles in one house?—Yes; that was in the district of the Gaslight and Coke Company. Witness went on to say, in reply to further questions, that it was no use giving theories as to the discrepancies between the tests, unless they had facts to support them. He had never before this time used a table photometer. He had used the bar photometer, and had always thought it a good instrument.

As good as the table photometer?—I cannot say that. The table photometer is a much more pleasant instrument to work with. The result is arrived at much more rapidly, without the same strain on the eyes in the hands of a competent examiner, though there might be a small variation owing to the minutiæ that I referred to; but the difference in results would never amount to as much as 2 candles.

Mr. STANLEY LEIGHTON: If you tapped the gas-mains as soon as they left the works, would you not get better tests?

*Witness:* I should be more likely, perhaps, to get a high illuminating power result. There are methods of enriching gas which do not carry to any great distance; so that to test just outside the works would not be a guarantee that the Company were making good gas. I cannot tell you whether or not the testing-stations are connected with one another. I have no knowledge as to whether the mains go from one station to another.

You say you know from what source the gas comes to the testing-station?—I do not know it, but it was stated here yesterday that, whereas the Companies do not know where the gas comes from to the various places in the schedule, they do know where it comes from to the testing-stations. There might be a variation in the quality of the gas made at one station and at another.

Mr. NEVILLE: There is nothing to prevent the Referees ordering continuous tests (say) from 12 o'clock at noon to midnight?

*Witness:* I do not know that they have that right. It is arranged that there shall be three tests at a minimum distance of one hour apart; and if the average result is below the standard, the Examiners have to make a fourth test.

The Referees have power under the Act to prescribe continuous tests. Should that not be sufficient to secure a good and proper supply of gas?—I say the present system is no guarantee.

Then your complaint is not against the Gas Companies, but against the Referees for not specifying a larger number of tests?—I say that the present three tests afford no guarantee.

You do not suggest that the Referees show that they do not know their business by prescribing an insufficient number of tests?—No; I do not suggest anything.

By Mr. SNAGGE: I do not think that the fixing of a specific hour for a test is a good thing; but if a test can be taken without the knowledge of the Company you may have a guarantee.

Mr. SNAGGE: Under section 10 of the Act of 1880, there is no obligation on the controlling authority, unless a request is made by the Company, to say at what hour the test is to be made. (To witness:) Do you know that the Commercial Gas Company have never asked as to the time of the tests, and have never been told?

*Witness:* No, I do not.

Mr. TALBOT: That is contrary to the fact, I understand. A representative of the Company is told every day, when he comes round, about the time the test will take place the next day.

Mr. SNAGGE: I am told a man does not go round every day.

The CHAIRMAN: There are three Companies; and it is clear the practice may differ.

Mr. BALFOUR BROWNE: I shall give the Committee evidence on that point.

Mr. SNAGGE: And I shall do the same.

Mr. NEVILLE: And so far as we are concerned, we have waived our right to be present at the testing in the City; and our gas is tested at all times.

The CHAIRMAN (to witness): Have you any knowledge of the methods pursued for enriching?

*Witness:* Only a general knowledge.

You know the methods pursued in the trade generally?—Yes, I have a general knowledge.

You said it was possible to adopt a method of enriching which would only continue to a limited distance from the centre of production. I presume there are other methods for enriching that would continue for miles away—that is to say, that would not be condensed in process of travelling?—Yes.

Is it possible to have a system of enriching at intervals so as to produce irregularity in the gas supplied in 24 hours—different degrees of enrichment?—The amount of enrichment can be regulated at will. Continuing, witness said that at large gas-works enrichment was constantly going on, and the enriched gas could be turned on to one or other gas-holder as required.

Would it be practically possible to produce an enrichment of the gas (say) up to 7 o'clock to the extent of 14 or 15 candle power, and then from that time forward to enrich it to 16 or 17 candles at will?—Well, I have no experience of how that can be done; but I imagine that it can be done.

Could it be done so promptly and systematically as to produce the desired result at a station a considerable distance from the source of supply?—That I do not know. There was no necessity to send gas out through a holder. As it left the works where it was manufactured, or any other premises, gas could be carburetted. He knew of no gas-works in London where they had carburetted water gas, or of any instance of carburetted water gas being turned straight into a main and not into a holder.

Mr. *Isaac Carr*, examined by Mr. TALBOT.

Witness stated that at Widnes the average of the official testings of gas for the last five years showed that it was of 18½-candle power; and the price was the lowest in the world. He had had considerable experience in the examination of gas with both the portable and the table photometer, and had never been able to distinguish any difference between the results obtained with the two. In 1895 he was instructed by the Toxteth Council to take tests, with the portable photometer, of the gas supplied in the district by the Liverpool Gas Company. The gas travelled six miles, and the standard was 20 candles; and the result of his testings with the portable photometer, which extended over several weeks, showed that the gas was of 21½-candle power.

Mr. TALBOT: You do not agree with the statement that has been made by a high authority that gas suffers considerable loss in traversing long mains?

*Witness*: I might say that our storing-station is 1¾ miles from the manufacturing station. The gas, after it is made, and before it is distributed to the consumers, travels 3½ miles—to the storage place and back again; and testings on the outgoing and returning gas have not shown any appreciable diminution in the quality.

And in order to confirm that still further, have you made experiments at the extremity of your district of supply at Widnes?—I have, with various qualities of gas; and after it has travelled from 5½ to 6 miles, I have not found any practical diminution. Before commencing any tests with the portable photometer, it was always put beside the fixed photometer, and tests made off the same pipe, so that I knew the two were giving identical results.

Supposing it was desired to enrich gas suddenly at any particular point at any specified time, would there be any difficulty in doing it?—None whatever.

By the CHAIRMAN: At Widnes the tests were made at his house from a 3-inch main after the gas had travelled 2½ miles. The tests under these conditions showed substantial uniformity over the whole district.

In further examination by Mr. TALBOT, witness said he enriched his gas with cannel, benzol spirit, or petroleum. At present, because of its cheapness, he used benzol. Every gas engineer knew perfectly well that with a carburetter the quality of gas could be increased in a very few minutes by 3, 4, or 5 candles.

Mr. EMMOTT: The whole of the supply for the time being?

*Witness* said it could by having the carburetter in proportion to the work it had to do. His carburetter was fixed at the works. If the gas were going into the town of 15-candle power, in five minutes' time, by the use of the carburetter, it could be brought up to 20 candles. The length of time occupied in completely changing the gas in the mains would depend on their capacity, and the velocity at which the gas passed through them.

Mr. TALBOT: Suppose you wanted to get gas of one quality at one part of the system, and of a different quality at another?

*Witness*: That could only be done by two series of mains.

The CHAIRMAN: Having enriched the gas as you do, does it, from the moment of production and enrichment, maintain that enrichment up to the moment of consumption—supposing it is consumed a week later?

*Witness*: If you take a day—yes. Gas is usually consumed within 24 hours.

In cross-examination by Mr. BALFOUR BROWNE, witness said he was Manager of the Widnes Corporation Gas-Works, and had hostile testing by an officer appointed by the Corporation.

Mr. BALFOUR BROWNE: But it is the Corporation's gas-works and the Corporation's own tester. Have you any testing-places at all except at the works?

*Witness*: No.

And when you talk about 18½ candles, that is a test made at the works. Your district is not a large one?—Well, for the consumption, it is very large. There are about 50 miles of mains at Widnes; the farthest being 7 or 8 miles from the works. Witness went on to say that the portable photometer with which he tested was one of Dibdin's, supplied by Messrs. W. Sugg and Co. No appreciable loss of enrichment, within a certain range, took place when gas passed through mains.

But we heard from Dr. Frankland that certain kinds of enrichment would not carry in the main?—I do not know what kind of enrichment he referred to. I can tell you what I refer to.

And you have not found any loss with benzol and petroleum?—That is so.

Water gas is of a very permanent character?—Yes; so the results show.

Therefore enrichment is not a mere temporary matter; it continues throughout the district?—I have found it so. The carburetter at Widnes is upon the main leading to the station meter, and therefore it deals with the whole of the gas made.

Supposing there is a main having in it a lot of dead gas, not enriched, of 14-candle power, and you then put in enriched gas of 18 candles, and the consumption is not going on, would the two gases mix?—If there was no consumption, no. Continuing, witness said the coal he used was the cheapest form of coal—slack—and it produced 10,000 cubic feet of gas per ton carbonized. He used cannel to enrich the gas.

I thought cannel was a thing of the past?—Oh, no; there is a new seam at Wigan.

I think you use the Dinsmore process?—The tar process—what is known as the Dinsmore process.

What, in your opinion, is the average quality of the gas produced by Newcastle and Durham coal?—15½ candles.

Will you tell me, if you have made any tests, what is the illuminating power of the gas you supply, not at the works?—I have already said the tests made at the works are identical with those made at my house. I made tests at various points in the district ten years ago with a portable photometer, but it was not one of Dibdin's. There was no water gas then. Witness went on to say he had also very recently tested the gas as it went from the works to the storing station, and returning, and then at his own house 2½ miles off. The make per year was 225 million cubic feet, and the coal used was 24,000 tons. He could not give exact figures as to the enrichment. By the Dinsmore process, the gas was enriched from 16 to 18½ candles.

The CHAIRMAN: Would it be possible to suddenly raise the standard of quality of the gas which was being sent out?

*Witness*: I do not think any gas engineer would deny that.

That is to say, this admixture of enrichment is a thing that can be brought to bear upon the supply from the retorts and purifiers at any moment, and produce an instantaneous result?—Yes. There are engineers in this country who do nothing but manufacture carburetting apparatus. Many of these are in possession of the gas companies and local authorities to-day; and their specific purpose is to improve the quality of the gas. You can put it up 2 or 3 candles at will.

Therefore at eight minutes past three you can be producing 14-candle, and at nine minutes past three 20-candle gas?—Yes.

Could that instantaneous or that very rapid effect be produced on such a large scale as to manifest itself over a large area?—That must greatly depend upon the circumstances—the consumption. You enrich the gas; but before the effect can be felt over the area the gas that is already in the mains must be displaced by the carburetted gas. The effect might be produced in an hour, or half an hour, when there was rapid consumption—say, at 9 o'clock in the evening.

Would it be possible to deceive the Corporation inspector, who is set to watch you so that the Corporation know you produce good gas, in that way, if you knew the hour at which he was going to take a test?—I have already said it is perfectly within our control to make the gas anything we like at a moment's notice.

Mr. NICOL: Do you mean to represent to us that by enrichment, and assuming you have twenty fixed stations which are subject to an official test of 16 candles, you can, within a few minutes, switch an amount of enrichment to any one of those stations—take the Gaslight and Coke Company?

*Witness*: That would entirely depend upon local conditions—as to how the mains were connected, the distance the testing-station was from the works, and the amount of consumption going on at the time.

Take the case we had here. There was one case in which at 7.25 p.m. at the official testing-station 11·3-candle power was arrived at. Do you mean to say (I only ask your opinion as a gas engineer) that in a few minutes the enrichment produced from the central works could raise that to the legal standard of 16 candles?—I could not answer that question without knowing the velocity of the gas in the main and the capacity of the main leading to that point.

By the CHAIRMAN: Having regard to the position of the testing-stations and works in connection with which the experiments referred to had been made, it would be quite possible to have gas supplied of 11·3-candle power, and 43 minutes later gas of 14·8-candle power.

The CHAIRMAN: With regard to the cost of enrichment, can you give us any figures?

*Witness*: The enrichment in my case I consider costs about 1⅞d. per candle per 1000 cubic feet—that is, with gas beginning at 16-candle power and cannel at the present price. If we took benzol, having just completed a contract at 8d. a gallon, I could enrich gas at ⅜d. per 1000 cubic feet.

You heard the evidence given before the Committee two or three days ago as to the experience in London of a difference chronically existing in the illuminating power of the gas supplied by any given Company as tested at the official testing-stations and at the board schools in and around the district?—Yes.

Can you, as a practical gas engineer, suggest to us any cause for that deviation between the testing-station and the board schools, outside the irregularity of production?—I know that gas at the works, as manufactured, is of varying quality. Unless care is taken to maintain the quality at one equal standard, it will rise and fall. I find this in my own case. I have to keep a careful watch, day and night, on the gas being made. A little carelessness on the part of the men in charge of the engine-room will reduce the quality—and the time of the charges, too.

Can you account for the peculiar phenomenon in the evidence that at the testing-stations there seems to be, on these officially reported examinations, a regular steady illuminating value of 16 candles, and not less, while at the same time, and taken from the same sources of supply, at different parts of the district there is a chronic and persistent lower level of value?—If it occurred in my own case I should say it came from different sources—that it was gas that was differently treated; but I do not know. In my own case, I should have no hesitation in saying that the gas of 11 or 12 candle power was treated differently from that of 16-candle power.

Mr. POPE: I do not follow what you mean by "treated."

Mr. EMMOTT: Enriched differently?

*Witness*: Yes.

Mr. POPE: It might not have been enriched at all.

The CHAIRMAN (to witness): Then in order to produce the remarkable phenomenon which has been brought before the Committee, you suggest that there must be some particular arrangement of the service-pipes, so that the better gas, when it is produced, towards the moment of testing, should be diverted to the station, whereas the bulk of the people are being served with the other sort of gas from the mains generally?

*Witness* could only repeat what he had already said. Under the circumstances, he did not see how the effect could otherwise be produced.

The Committee then adjourned until the 1st prox.

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**The Aldeburgh Corporation and the Water-Works.**—At a recent special meeting of the Aldeburgh Town Council, the Town Clerk (Mr. H. C. Casley) read a letter from the Town Solicitors to the Water Company, in which they stated that the Directors were prepared to accept the offer of the Corporation to purchase the undertaking for the sum of £5000. The Mayor said he should like to add, with regard to this letter, that he had met the Directors on one or two occasions, and had been received with the utmost courtesy, and every desire was shown to come to terms with the town. The following resolution was carried unanimously: "That it be communicated to the Local Government Board that the Water-Works Company are prepared to sell their undertaking for the sum of £5000, subject to the approval of the Board; that it is the firm intention of this Council to take steps to provide a proper supply of water; and that the Mayor and Mr. Mansergh will wait upon the Board and explain the Engineer's views for providing such supply, and the cost of the necessary works."

# LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

### Monday, April 2.

(*Before Justices* RIDLEY *and* DARLING, *sitting as a Divisional Court.*)

**London County Council v. Wandsworth and Putney Gas Company.**

This was an appeal by the London County Council against the decision of the Magistrate at the South-Western Police Court (Mr. E. W. Garrett), on Nov. 14 last, dismissing a summons taken out against the Wandsworth and Putney Gas Company for an alleged contravention of the London Building Act, 1894, in respect of the erection of a new purifier-house. The proceedings before the Magistrate were reported in the "JOURNAL" for Nov. 21 last (p. 1251).

Mr. HORACE AVORY and Mr. F. DALDY appeared for the London County Council. Lord ROBERT CECIL, Q.C., and Mr. SNAGGE represented the Company.

Mr. AVORY said this was a special case stated by Mr. E. W. Garrett, Magistrate of the South-Western Police Court; and the question raised for their Lordships' decision was whether a Gas Company were empowered, by their Special Act, to erect buildings in contravention of the General Act relating to London. The respondents appeared in answer to a summons charging that they, at certain highways, Water Side and Worple Road, in Wandsworth, did, for 28 days after service of notice, neglect to comply with the requirements of that notice—namely, to set back a new building so that every part of the external walls should be at a distance in every direction, not less than the distance permitted under part 2 of the London Building Act, 1894, from the centre of the roadways. The proceedings were taken under section 13 of the Act. It was admitted that both these roads were carriage ways; and the complaint was that the Gas Company's buildings were within 20 feet of the centre of the roads. At the hearing of the information, the following facts were proved or admitted: Respondents were originally a Joint-Stock Company, which in 1856 was incorporated with parliamentary powers. They subsequently obtained two other Acts in 1866 and 1880. By section 4 of the Act of 1866, it was provided "that the Company may on the land specified in the schedule to the Act erect such gas-works, whether for manufacture, storage, or the supply of gas, as they think fit; but shall not, under the powers of the Act erect or make any works for the manufacture, storage, or supply of gas, except on the lands specified in the schedule. The works in question were not erected upon any lands specified in that Act. By section 2 of the Act of 1880, it was provided that both Acts—1880 and 1866—were to be construed together, in so far as they were not inconsistent. Section 29 said the Company might from time to time, for the purpose of their undertaking, purchase land, in addition to the lands held by them, not exceeding 10 acres; but the Company should not manufacture gas except on the lands described in the schedule to the Act. Section 30 said the Company may upon any lands belonging to them erect dwelling-houses and cottages for the residence and accommodation of their workmen and families; and they may also make and maintain any roads and approaches to such dwellings as were necessary, provided that they shall not be exempted from any of the provisions of the Metropolis Management Act, 1855, and the Acts amending same." In February, 1899, respondents began to erect the building referred to in the information, and persisted in its erection notwithstanding the objection of the District Surveyor, and completed it. The dimensions of the building were shown by the plans. The external wall towards the street called Water Side was at a distance of 15 feet less than the prescribed distance from the centre of the roadway, and the external wall towards Worple Road, was only a foot or two less than the prescribed distance. It was admitted for the purposes of the case that the building, which was a purifier-house containing four purifiers, was built on land acquired by respondents in 1875. The land was very limited in extent; and in order that the Company might be in a position to carry on their business and meet the demands on them, it was necessary that they should have this building in use. The appellants in May, 1899, while the building was in course of erection, served a notice on the respondents; but they refused to comply with the requirements. They contended that, by reason of the provisions of their Special Acts, they were not (in respect of the building in question) subject to the provisions of the London Building Act, upon which the information was founded. Appellants contended that the land in question was subject in the hands of the respondents to the ordinary law, including the provisions of the Metropolis Management Act and the London Building Act. Secondly, that the provisions relied upon by the respondents did not confer any right, power, or privilege in them as they alleged. The Magistrate was of opinion that the contention of the respondents was right; and he dismissed the information subject to a case stated. The question resolved itself into this: Whether there was in the Company's Special Acts anything so inconsistent with the London Building Act, 1894, that they could not be read together. There were a number of authorities on this question; but the principle of them all resolved itself into what he had stated—viz., was there something enacted by the Special Acts so inconsistent with the General Act that the two could not stand together. If the provisions of the Special Acts were not inconsistent with the General Act, then the General Act, of course, applied to the Gas Company as well as to everybody else. For this purpose, he would in the first place call attention to the provisions of the General Act which affected this question; and then he would examine the Special Acts to see whether there was anything so inconsistent that they could not be read together. The proceedings here were taken under section 13 of the London Building Act, 1894; and by the first sub-section no person was to erect any building in such a manner that the external wall should be at a distance less than the prescribed distance without the consent, in writing, of the Council. That was a general enactment that no person should erect. By sub-section 6, it was provided that nothing in the section should affect the exercise of any powers conferred upon railway companies; but there was no exemption in favour of gas companies. Again, by section 31 of the General Act, there was a provision that "nothing in this part of the Act shall affect the exercise of any powers conferred upon any railway company by Special Act of Parliament." That related to building frontage again; and there was an express saving of railway companies, but no saving of gas companies. In section 75, there was a saving clause for gas companies; but it only related to party walls in buildings of certain dimensions. By section 121, there was another saving for the benefit of gas companies, which said "the provisions of this part of this Act relating to dangerous and obnoxious businesses shall not apply to any public gas-works." The next important section was 205, which was set out in the case. It said: "In addition to any exemption referring to gas companies contained in this Act, nothing in this Act contained shall in any way take away, alter, prejudice, or affect any of the powers, rights, and privileges conferred upon the gas company by any Act of Parliament as existing immediately before the passing of this Act." This carried them no further, unless they could show by the Special Act that power had been conferred upon them of doing that which was complained of. This brought him back to the general proposition. He was going to submit that this question was precisely on all-fours with the case their Lordships decided some little while ago—the *Uckfield District Council v. Crowborough District Water Company*—which referred to a water-tower erected without the sanction of the District Surveyor, and which their Lordships decided against the Water Company. It could not be said there was anything in the General Act exempting the Gas Company from the provisions of section 13. On the contrary, there was a general enactment that they, and all other persons, were not to build within the prescribed distance of the highway. Dealing with the Special Acts on which the respondents relied, he would show that there was nothing which authorized them expressly to build within the prescribed distance of the highway. The first Act was 1856; but that Act gave them no power to put up works on the land in question.

In reply to an interpolation from Justice Ridley,

Lord R. CECIL said he thought there existed a little misapprehension. This was not a case of gas-works in the middle of a highway. The land in question was the property of the Gas Company from 1875; and they took down old buildings and rebuilt. It was not a case of putting out in the highway. This was their own land, and not a highway at all.

Mr. AVORY replied that he was not suggesting they were building on a highway; but they were building within the prescribed distance of the highway.

Justice DARLING: It comes to this. They say: "This is our bit of land; and because we may put up gas-works on our land, we may put up gas-works on any part of it, notwithstanding any General Act of Parliament.

Lord R. CECIL replied that that was so.

Justice DARLING said what he was wondering was whether they would come to any enactment which said that in putting up the gas-works here, there, and everythere the Company were not to be bound by the law relating to highways.

Mr. AVORY replied he was going through the Special Acts for the purpose of proving the negative proposition, and of anticipating what his learned friend would say. There was nothing authorizing them to build within the prescribed distance of the highway. In the Act of 1856, there was nothing, because the land was not acquired until 1875. The next Act was that of 1866. Section 4 said: "The Company may, on the land specified in the schedule to this Act, erect such gas-works as they think fit, but shall not, under the powers of the Act, erect or make any works for the manufacture, storage, or supply of gas except on the lands specified in the schedule." That gave them no authority to do this, because this land was not specified in the schedule. In passing, he remarked that there was a difference between the provisions relating to the land on which they might carry on the manufacture of gas, and the land which they might acquire for other purposes of their business. By the Gas-Works Clauses Act of 1847, which was incorporated, and to which they were subject, there was an express provision that they were not to carry on their business in such a way as to amount to a nuisance; and Parliament, while enacting that limited the area upon which the Company might manufacture gas. Section 25 of the 1866 Act said "Nothing in this Act shall extend to prejudice, diminish, alter, or take away any rights, powers, or authorities vested, or to be vested, in the Metropolitan Board of Works, District Boards, and Vestries." The next Act was 1880; and it was under this Act that the Company could find the power, if any, which they relied on. Section 29 said "the Company may from time to time, for the purposes of their undertaking, purchase, take, and hold by agreement, in addition to the land now held by them and described in the schedule to this Act, any lands not exceeding 10 acres; but the Company shall not manufacture gas or residual products except on the land described in the schedule." It was found by the case that the land upon which the building in question was erected was land described in the schedule, which they had acquired in 1875 before the Act of 1880; and the only thing therefore upon which the Company could rely in this Act of 1880 as conferring upon them the power to erect this building in the manner complained of, was this negative proviso—"that the Company shall not manufacture gas or residual products except on the lands described in the schedule to the Act." It was for this reason he called attention to the distinction made in the earlier Acts between land which they might acquire and land upon which they might manufacture gas. A limit was put by Parliament upon their right to manufacture gas upon a certain area; and the same limitation was introduced into the Act of 1880—not for the purpose of conferring upon them an express power to build upon a piece of land, but for the purpose of limiting the right they would otherwise have upon any land they might afterwards have acquired. Therefore he did not see how a negative proviso could take them out of the General Act.

Justice RIDLEY: It says: "You shall not manufacture gas except upon that land." They must say they can manufacture anywhere on the whole of the land——

Justice DARLING: Even though it does not say: "Because you may manufacture there, you may manufacture just as you please, or within a space where naturally there should be a certain distance from the highway." If you can do that, and observe the Building Act as well, I do not see any difficulty.

Mr. AVORY said the point was—was there such an inconsistency that they could not carry out the objects of the Special Acts without infringing the provisions of the General Act? In the case of the *Uckfield District Council v. Crowborough District Water-Works Company*, which was before

their Lordships in October last, the question was whether the Special Act, which gave the Company power to erect a water-tower upon certain land specified in the Act of Parliament, exempted them from the general provisions of the Public Health Act relating to buildings, which required them to give notice to the Surveyor or Local Authority before commencing to erect their buildings; and their Lordships held that, notwithstanding they had power to erect a building upon land specified by Act of Parliament, the Company were still liable to the provisions of the General Act, and were bound to give notice to the Local Authority before commencing to erect.

Justice RIDLEY: There is more reason here why the authorities should have power to interfere.

Justice DARLING asked on what the Magistrate based his decision.

Mr. DALDY said it rather went in this way: The Gas Company based their contention upon certain authorities stated in the case. He argued that these authorities had not much to do with it; and he urged it upon the same lines as Mr. Avory was now proceeding on—though perhaps not so fully. But the Magistrate thought the case was covered by the authorities quoted.

Mr. AVORY said he had a shorthand note of the judgment; and it was precisely to that effect. The Magistrate said he was much impressed by Mr. Daldy's argument; and he should have felt himself bound to give effect to it, but for the cases quoted. There was no reason, he submitted, in the nature of things, why a gas company should have the right to build so as to encroach upon the highway. It was quite clear they did not know better than the Local Authority as to what was the proper position for their buildings. The Local Authority were the best judges of whether the buildings should be within the prescribed distance or not. There was nothing in the powers conferred upon the Gas Company to show that they had any right to build in advance of the general building line. Unless they had that power, nothing in the exemption contained in section 205 of the General Act referred to would help them, because the utmost they amounted to was that nothing in the General Act was to take away any powers, privileges, or rights conferred upon them by their Special Acts. For these reasons, he submitted the Magistrate was wrong and the appeal should be allowed.

Lord R. CECIL said he should like, first of all, to call attention to the exact phraseology of the general exemption clause in section 205 of the General Act (set out above). The effect of that was this: If before the passing of the Act of 1894, it was lawful to erect this building, then this Act did not make it unlawful. The Gas Company were in precisely the same position as they were before the passing of the Act of 1894—"Nothing in this Act is to alter or affect any of its rights, powers, and privileges as existed immediately before the Act." The real question was not what were the provisions of this Act, but what the position of the Gas Company was before the passing of the Act of 1894, because it did not put them in any worse position than they were before. He did not himself quite follow the argument his learned friend attempted to base upon the fact that certain exemptions were given to railway companies and not to gas companies. The real question, and the whole question, was whether the Gas Company could have erected works on this land before the passing of the Act of 1894. This Bill was drafted by a Private Bill Committee of the House of Commons, and all sorts of persons appeared for various people and petitioned for exemptions; but the Railway Companies had no such general exemption as that given to the Gas Companies.

Justice RIDLEY said it was a very different matter for Railway Companies.

Lord R. CECIL said, at all events, he submitted that the Gas Company were precisely in the same condition as before the Act was passed.

Justice RIDLEY: You have got to argue that they could do as they liked before the Act.

Lord R. CECIL said this was not a case of building out into a highway—of projecting beyond the building line—but of building on their own land, within their own fence; and the only question was whether they were entitled to put a building so near the edge of their own ground as to be within 20 feet of the highway. Whatever was the result of this case, the land would still remain the property of the Company, though they might not be allowed to build on it.

Mr. AVORY said the Act expressly provided that they should not bring the forecourt or fence within 20 feet of the highway.

Lord R. CECIL: We are not bound to take it away when it is there. You do not suggest that the effect of this will be to throw the land into the highway.

Mr. AVORY: Of course, I do. That is the whole object of the Act—that the width of the roadway shall be 40 feet.

Lord R. CECIL: If that is your object, I am afraid you will be out of court, because these proceedings will not have that effect. All they will do, will be to prevent us utilizing our land within 20 feet of the road. There is nothing to compel us to throw the land into the highway; it will remain our private property. There is no power to confiscate our property, which, if my friend's contention is right, it would have the effect of doing. We are entitled to retain the land; but we may not build up to the edge of our own property, if it is within 20 feet of the centre of the road. In this case, there was a wall marking the edge of the roadway. That will remain; and we are not bound to take it down. The learned Counsel (continuing) said that, coming to the powers conferred on the Company by their Private Acts, he did not think the Act of 1856 affected the case. Section 2 of the Act of 1880 provided that the Acts of 1866 and 1880 were to be read together; and section 4 of the Act of 1866 was the important one. It said: "The Company may, on the land specified in the schedule to the Act, erect such gas-works, whether for manufacture, storage, or supply of gas, or otherwise, as they think fit." This, he submitted, gave them power to erect on the scheduled land such gas-works as they thought fit.

Justice DARLING: You say it means, erect them as they think fit?

Lord R. CECIL said it was two-fold. It first gave them power to erect such works as they thought fit; and it provided that they should not erect gas-works at all, except upon the lands specified. There was a reason why gas companies were forbidden to erect works except on land scheduled. By the Standing Orders of Parliament, everyone who lived within a certain distance of the gas-works had the right to petition the Committee to which the Bill was referred, and notices had to be served on all those so that they might be heard. Therefore it was provided that the Company should not erect works except upon scheduled land. His learned friend admitted, in answer to this section, that, as far as the Act of 1866 was concerned, they might build on the land scheduled in the Act, but said this did not refer to any land scheduled in the Act of 1880. He submitted it did impliedly refer both to the land scheduled in 1880 and that in 1866; and this was why he relied on section 2 of the Act of 1880, which made all the provisions of the Act of 1866 to be read with the Act of 1880. If that were not so, there was no power given to erect gas-works in the Act of 1880 at all, except in this way. Therefore, the right way of reading these two Acts was to take clause 4 out of the Act of 1866, and read it as part of the Act of 1880. If they did so, then the provision was perfectly clear that the Company were entitled to erect such gas-works as they thought fit on the land scheduled to the Act.

Justice DARLING: Upon such part of the land as they think fit, notwithstanding any General Act to the contrary that does not expressly forbid.

Lord R. CECIL assented. He submitted it gave them power in spite of any General Act; and he should have to refer to some decisions, as he contended that the case came within those decisions, and gave them power to make such gas-works as they thought fit, notwithstanding the erection itself infringed the conditions of the General Building Act. He quite conceded that the whole question was whether the Special Act was inconsistent with the General Act.

Justice RIDLEY: Your argument seems to be answered by our decision in the Crowborough case. Section 49 of the Gas-Works Clauses Act seems to be the same as section 93 of the Water-Works Clauses Act; and we decided that the provisions of that section did not prevent the General Act applying. Section 49 says: "You shall not be exempt from any General Act for improving the sanitary conditions of towns."

Lord R. CECIL submitted the Act of 1894 had nothing to do with this case, because of section 205, which was inserted to put the Gas Company in precisely the same position as they occupied before the Act was passed.

Mr. AVORY said this would only throw them back to the earlier Building Act of 1878, which contained exactly the same conditions.

Lord R. CECIL submitted that, by section 205 of the Act of 1894, any power, right, or privilege which the Company possessed at the passing of the Act was preserved to them. If they had the right to cover this land with purifiers, that was preserved to them by the section, and could not be taken away by the Act of 1894. Under the Act of 1880, they were entitled to erect such works as they thought fit. It was said that was not so, because by the 49th section of the Gas-Works Clauses Act it was provided that "nothing herein or in the Special Act contained shall be deemed to exempt the undertakers from any General Act relating to gas-works, or any Act for improving the sanitary condition of towns and populous districts, which may be passed in the same session in which the Special Act is passed, or any future session of Parliament." The effect of this, he submitted, was that nothing in the Act of 1880 was to exempt the Company from any Sanitary Act passed in 1880, or subsequent to 1880. If it were not for section 205 of the Act of 1894, he admitted at once the Company would be subject to the Act, because of this section 49. He said they were not subject to section 13, because of this section 205; and section 47 did not render them subject to any sanitary legislation, except that passed after 1880. He admitted that, under the Building Act of 1878, there were provisions similar to section 13 of the Act of 1894; and he agreed that they were in force in London at the date of the passing of the Act of 1894, and that, so far as the Company were subject to the Act of 1878, they continued subject to it. But the Act which he said exempted them from this was their Special Act of 1880, which incorporated the Gas-Works Clauses Act of 1847. This only rendered them liable to Sanitary Acts passed in the same session, or in any subsequent session; it did not render them liable to anything passed before then. The effect of the legislation of 1880 was, he submitted, to exempt them from all the General Acts relating to building.

Justice RIDLEY: Although they were subject to them up to that time.

Lord R. CECIL: They were not subject.

Justice RIDLEY: Oh, yes, they were. You cannot get out of that.

Lord R. CECIL submitted they never were subject, as far as this land was concerned.

Justice RIDLEY repeated they were subject. He did not see how they could escape from the judgment in the case of the Crowborough Water Company.

Justice DARLING: Do you admit that the Act of 1878 would have prevented you doing this, and that the Act of 1880 cleared you from all the restrictions of the Act of 1878?

Lord R. CECIL: That is my contention.

Justice DARLING: And then, being cleared by the Act of 1880, they could in 1893 have done this, though they could not have done it after 1894, except for section 205; and section 205 kept them in the same position as they were before. Then the whole of your argument depends upon your showing us that the Act of 1880 exempted them from complying with the Act of 1878.

Lord R. CECIL: That is the whole of my argument. If I can show that the effect of the Act of 1880 was to exempt them from the Act of 1878, then, I submit, they are now exempt from 1894. Section 4 of the Act of 1866 is, in my opinion, the covering section that, in strong words, gives to the Company power to make such works as they think fit on the scheduled land.

Justice RIDLEY: That was all subject to the provisions of any Act passed in any future session; and therefore it included the Act of 1878, which was passed in a future year. I do not think the matter is arguable. You had no powers under the Act of 1878; and you have got to find them in the Act of 1880.

Lord R. CECIL: But in the Act of 1880, it says the provisions of the Act of 1866 shall be part of the Act of 1880.

Justice DARLING: But the Act of 1866 does not thereby become an Act of 1880.

Lord R. CECIL: I submit it does for this purpose. The Act of 1880 incorporates the provisions of the earlier Acts. It must have been intended, otherwise the Company, under the Act of 1880, would have no power to erect gas-works at all.

Justice RIDLEY: I still think it is unarguable.

Lord R. CECIL submitted that if they read section 4 of the Act of 1866 into the Act of 1880, the Company had power to erect gas-works wherever they liked on their own land. Section 205 was put in the Act of

1894 to preserve whatever rights the Company had. If his contention were correct, section 30 was excellent common sense; if he were wrong, it was nonsense. Section 30 said, so far as the cottages and dwellings were concerned, they were to be subject to the Metropolis Management Act and the Metropolitan Building Act, 1878. If the contention of the other side were right, the whole of the buildings of the Company were always subject to the Act of 1878. If this was so, why should these cottages be expressly mentioned by section 30? Counsel then quoted the cases which were cited in the Court below, including *Limehouse District Board of Works v. London and Blackwall Railway, and London County Council v. City and South London Railway.*

Mr. DALDY, replying upon the whole case, said, in answer to his learned friend's remarks about section 30, in which the cottages and houses of the Gas Company were expressly made subject to the Metropolis Management Act, there was a sufficient explanation of this. Cottages and roads were not things which came within the ordinary business of gas companies, and so would not come within the purview of such an Act as the Gas-Works Clauses Act, 1847. Therefore, as there might be a doubt whether the provisions in that Act extended to such things as cottages and roadways made on the Company's property (an exception altogether from the ordinary course of a gas company's business), it was probably for this reason they were made expressly subject to the Metropolis Management Act by section 30. As to section 4, which said the Company might erect such gas-works as they thought fit, the nature of the buildings was left to the discretion of the Company; but nothing was said as to the buildings being put on all or any part of the land. Moreover, the section was not like one in a Railway Act or a Water Act, where they found an express direction to build the railway or water-works on some particular part of the land. The object of the section was to divide the land which the Company might use for the manufacture of gas from the other parts which they might not use for this purpose; and the section was solely devoted to dividing off the land in that manner. Supposing it could be read in the way Lord R. Cecil said, what was the result? The whole of his argument was this—that when the two Acts were to be construed together, one must take section 4 of the earlier Act and make it into section 4 of the combined Act, and do the best one could with it. But if they looked at section 2 of the Act of 1880, it said the Act and the Acts of 1856 and 1866 should be construed together as one Act, except in so far as such construction would be inconsistent with, or repugnant to, the provisions of the later Act. Was there not an inconsistency, when they found expressly incorporated in the Act of 1880 the Gas-Works Clauses Act, which provided that the provisions of the Public Sanitary Acts were not to be affected? This section 205 of the London Building Act, 1894, could not possibly be read as widely as his friend wanted to read it, and as to succeed he must read it. There was nothing in the section to show that the Company were not to be subject, like any other individual or landowner, to any progressive changes in legislation. It could only have meant, where there was some clearly expressed privilege or right particular to this Company, that it should be preserved to them; and though, like other individuals, they had to suffer from further legislation to some extent, they were not to lose any such particular rights.

This concluded the arguments.

Justice RIDLEY, in giving judgment, said: I think the decision of the Magistrate is wrong, and that the Gas Company are subject to the provisions of the London Building Act, 1894. It appears to me that the case is difficult to distinguish from the decision in the *Uckfield District Council v. Crowborough District Water Company.* Not that the facts are precisely the same, but I think this case is on all-fours with it so far as this, that it was there said that, although the provisions of the section of the Act of Parliament only referred to the Acts of Parliament to be passed for the improvement of the sanitary conditions of towns and populous districts to be passed in the same session, or in any future session, and therefore did not in its terms preclude past Acts of Parliament on the same subject, still the beneficiaries under a Special Act like the present must be held to be subject to the general provisions of Acts of Parliament on the same subject, unless there was something inconsistent with their own Act, and so inconsistent with the provisions of the General Act as led to the opposite inference that it was not intended to give powers which were inconsistent and contrary to those which anybody else would possess. I think that principle is certainly stronger in its application to the present case. The Gas Company contend that they are to be treated as having the power to put their buildings where other persons cannot. They have to satisfy us there is nothing in their Act of Parliament inconsistent with the powers contained in the General Act. I cannot find there is any expression in their own series of Acts which leads to that conclusion. The chief expression relied on by Lord R. Cecil is the words, "as they think fit" contained in section 4 of the Act of 1866. Those words occur in the section which is directed to this subject, where shall the gas be manufactured? and one must remember that in the case of gas companies it must be always of great importance to specify where, and in what place, the gas manufactories can be put up as opposed to the place where the storage and other works connected with them can be erected. The section says: "The Company may, on the land specified in the schedule, erect such gas-works as they think fit, but shall not, under the powers of the Act, erect or make any works for the manufacture of gas except on the land specified in the schedule." I think that means you may put up such gas-works as you want—whether it be for manufacture, or supply, or storage of gas—but you shall not put them up anywhere except on the land specified in the schedule. It does not say you may put them up wherever you please, independent of the Act of Parliament. So long as you put them on the land specified in the schedule, you have a discretion to say what they shall be. If we are to say that the words "as they think fit" were ever intended to give them a discretion to put them wherever they pleased, independent of the provisions of other Acts, one has got to remember there is a section in the same Act which embodies clause 49 of the Gas-Works Clauses Act of 1847, which expressly includes all regulations of Acts of Parliament relating to the sanitary conditions of towns. I think they were subject at that time to all such legislation as was then in existence in the year 1866 relating to the sanitary conditions of towns. It is true, as Lord R. Cecil says, that the provision now contained in the London Building Act, 1894, relating to the distance within which buildings must be placed from the centre of highways, did not come into existence until 1878; but the state of things is this: The Gas Company are subject to all legislation passed in a general way for the sanitary condition of towns. As that changes so do the Company's powers. They are subject to it; and therefore, when the Act of 1878 was passed, which imposed this limit as to buildings being put up within a certain distance of the highway, they became subject to it, as hitherto up to 1878 they were to all other conditions. In 1878, the Building Act was passed; and I understand that its provisions were similar to those of the Act of 1894. At that time therefore, in 1879, it must be conceded that the Gas Company were subject to this law—that they could not put their buildings within 20 feet of the highway. But it is now contended that, by reason of the passing of their Act of 1880, a different meaning was put on the Act of 1866, and not only that the powers of the Gas Company were extended, but they then became able to do that which they had not hitherto done, and that, having got into that position, section 205 of the London Building Act preserved that to them, as a privilege which belonged to them before the Act was passed. That is a very strong contention to put forward, because I can find nothing in the Act of 1880 which gives them more privileges than they had before. The Act included section 49 of the Gas-Works Clauses Act, and it left them subject to the general legislation on the subject. Therefore, I think all the powers they got are subject from time to time to the general law of the land. If that is the rule we are to apply to the construction of this Act of Parliament, they were throughout subject to the provision now in the London Building Act, 1894, and formerly in the Metropolis Management Act, which says buildings are not to be put within a distance of 20 feet from the highway. Whatever the buildings are, they are subject to that. Where are we, in the Act of 1880, to find any extended powers? I find in section 2 nothing except that the two Acts are to be read together. Section 205 of the Act of 1894 says: "In addition to any exemption referring to gas companies contained in this Act, nothing in this Act contained shall in any way take away, alter, prejudice, or affect any of the powers, rights, and privileges conferred upon the gas company by any Act of Parliament, and as existed immediately before the passing of this Act." That is an enactment in general terms saving the existing rights of a gas company. They may be of various kinds and sorts, but it does not, it seems to me, by giving them that saving, give them any more power than they hitherto possessed. It does not give them any right to say we will do something inconsistent with the General Acts of Parliament relating to the subject. The section may have been inserted because it was thought there were some particulars in respect of which their rights ought to be preserved; but I do not think it can bear the strong meaning put upon it by the respondents. I think the appeal ought to succeed, and I do not think it necessary to add anything as to the cases quoted by Lord R. Cecil.

Justice DARLING: In this case, I cannot say I think it is free from difficulty; and I go a very long way with Lord R. Cecil in the argument he addressed to us. The way in which the case strikes me is this: It seems to me building upon this particular piece of land was not possible until it was authorized by the Special Act of 1880. It would have been forbidden unless it complied with the Building Act of 1878. But by section 2 of the Act of 1880, which incorporates the Act of 1866, and therefore incorporates section 4 of that Act, it says the Company may, on the land specified on the schedule, erect such gas-works as they think fit. It does seem to me, if the matter had stopped there, they might have erected gas-works without paying any attention to the Building Act of 1878. So far, I am with Lord R. Cecil. But the Act of 1880 does not stop there. It goes on, in section 3, to incorporate not only the Acts of 1856 and 1866, but the Gas-Works Clauses Act of 1847, and that Act says this: "Nothing herein, or in the Special Act contained, shall be deemed to exempt the undertakers from any General Act relating to gas-works, or any Act relating to the improvement of the sanitary conditions of towns or populous districts in the same or future session." I do not take any notice of the word "future" because the Act of 1847 is incorporated in the Act of 1880, and therefore it is enacted again. It is there Lord R. Cecil's argument fails. It seems to me the Act of 1847 is re-enacted by the Gas Company's own Special Act of 1880; and it is by that means distinctly applied and becomes part of the Special Act. Now I take the words of section 49 of the Gas-Works Clauses Act, and it seems to me when we get to the words "future session," we have now to see what is done, not after 1847 or not after 1878, but after 1880, as the Act of 1878 is by that preserved in 1880. In 1894, is passed the Building Act, which contains provisions just as restrictive upon the Gas Company as the Act of 1878. The Act of 1894 was a future Act; and as a future Act was preserved by section 49 of the Act of 1847, and was preserved by the section incorporated into the very Special Act of the Company itself. Therefore the future Act to which we have to look to is 1894. Section 205 provides that "in addition to any exemption referring to gas companies contained in this Act, nothing in this Act contained shall in any way take away, alter, prejudice, or affect any of the powers, rights, and privileges conferred upon the gas company by any Act of Parliament as existed immediately before the passing of the Act." That section, instead of having the result which Lord R. Cecil contended for, and giving them absolute freedom to do as they pleased, preserves them their liberties under section 4 of the 1866 Act, but it also preserves the restrictions upon them. Therefore, I do not think there ever was a moment when this Gas Company, who acquired all their rights by virtue of Special Acts, were exempt from the duties imposed by the Building Act, of 1878, until the place of the 1878 Act was taken by the Building Act of 1894. Therefore they are bound by the restrictions of the Act of 1894. For these reasons, I think the appeal must be allowed.

The case was accordingly ordered to be remitted back to be dealt with by the Magistrate.

Mr. SNAGGE asked for leave to appeal further.

Justice RIDLEY said he had no objection to granting leave; but there was no appeal from their decision in a matter of this kind, which was in the nature of a criminal proceeding.

The appeal was allowed, with costs.

## The Delivery of Petroleum to the Dublin Gas-Works.

In the High Court of Justice (Ireland) last Saturday week, before the Master of the Rolls, Mr. Matheson, Q.C., applied on behalf of the Dublin Port and Docks Board for an order that the Gas Company, their servants, agents, and workmen might be restrained by injunction from discharging

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### WITH GAS AT A PRESSURE OF 9 INCHES.

## MOST PRACTICAL; MOST ECONOMICAL; MOST SUCCESSFUL

### SYSTEM OF ARTIFICIAL LIGHTING FOR RAILWAY STATIONS, DOCK WAREHOUSES, LARGE WORKSHOPS, THEATRES, HALLS, &c., &c.

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**DOUBLE THE LIGHT**

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**50 % LESS MANTLES**

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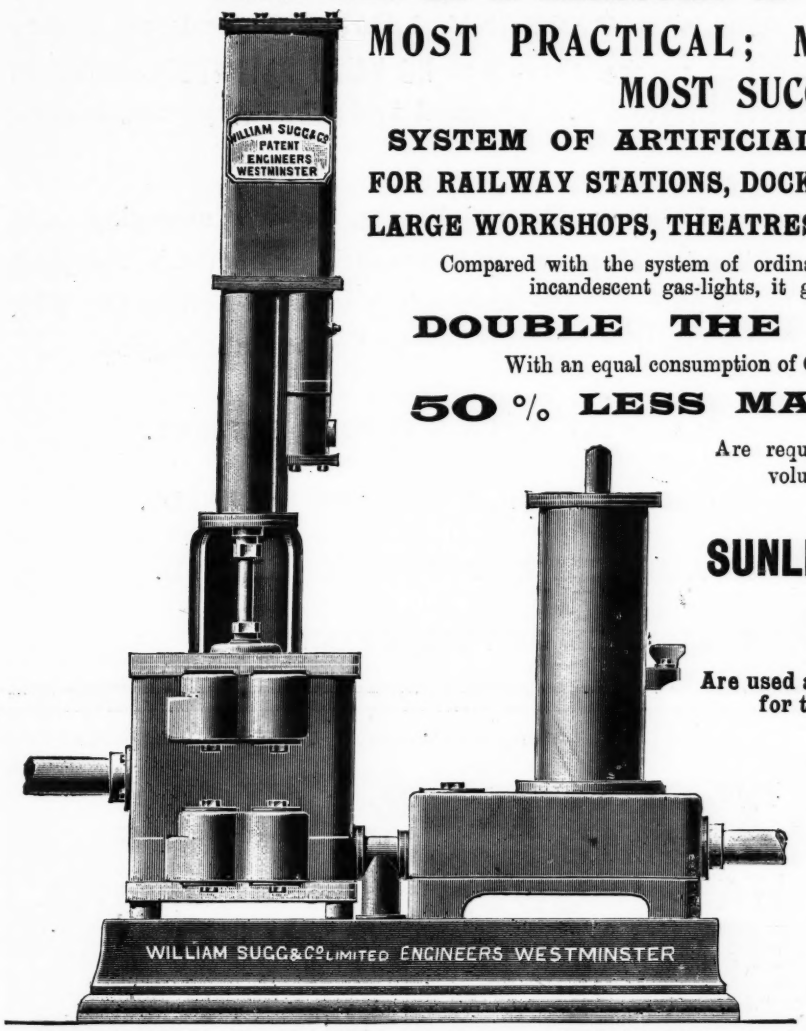


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By means of the Patent Automatic Double Regulator, the flow of Water and Gas is regulated to the exact quantity required for the actual number of burners in use, and both Water and Gas are automatically stopped when the lights are extinguished.

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The Increased Pressure of Gas is constant, without fluctuation.

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# VINCENT WORKS, WESTMINSTER.

# A "NEEDFUL" EXPLANATION.

We note an Advertisement in the "JOURNAL," under the name of the NEW CONVEYOR COMPANY, stating that they had taken over the business of the AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED; and, as it may create a false impression, we beg to say there are **NO VALID PATENTS** existing in connection with Inclined Retorts (beyond a few small and subsidiary ones, dealing with details).

We are prepared to erect Inclined Retort Plants, with Conveying and Elevating Machinery, Overhead Tanks, Hoppers, and Measuring Chambers, complete and **FREE OF ROYALTY.** In the list of places given, only a few were erected by the New Conveyor Company—nearly all the remainder being erected by the undersigned.

**JONAS DRAKE & SON, OVENDEN, HALIFAX.**

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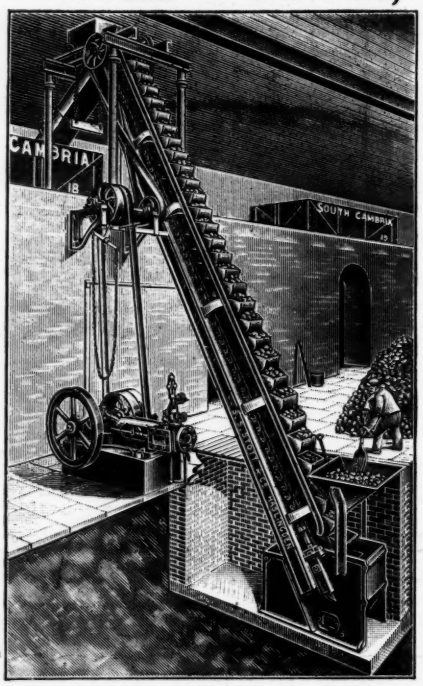


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PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

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or accepting delivery in bulk of a cargo of petroleum about to arrive in the harbour in the tank-steamer "Ballaclime," by means of tubes or pipes laid across the quay or walls of the plaintiffs, or from discharging such a cargo in any manner other than should be approved of by the plaintiffs. Counsel explained that some time ago the Gas Company began the manufacture of water gas; and for this purpose large quantities of petroleum were imported in tank-steamers, and pumped from the vessels by means of pipes to the gas-works. Some months ago when a tank-steamer arrived, the plaintiffs allowed defendants to connect their underground pipes with a flexible tube laid across the quay to the vessel's side; about the same time informing them that they would not permit them to use such a tube in future. The plaintiffs now heard that a tank-steamer was coming to defendants' order (on the morrow); and in order to prevent a breach of the peace, they asked for an injunction. Mr. Gordon, Q.C., for the defendants, said the whole question was one of wayleave, for which the plaintiffs wished to charge defendants £200 a year for the short distance a pipe would be laid under their quay. Defendants disputed the plaintiffs' right to the land there, and contended they were empowered to lay this pipe there as they were to lay gas-pipes in any part of the city, and submitted that the discharge by the flexible tube was a reasonable and proper means of discharging the vessel. The Master of the Rolls adjourned the motion pending the trial of the action to be brought to decide the defendants' rights; they to abide any question of damage to be raised in the meanwhile.

### The Committal of Infringers of Welsbach Patents.

In the Court of Appeal, last Wednesday, Lords Justices Collins, Vaughan Williams, and Romer concluded the hearing of an appeal of one Reimer, of Stourbridge, from an order of Mr. Justice Day, committing him to prison for contempt of Court—he having, it was alleged, disobeyed an interim injunction granted in the action to restrain certain persons from infringing two of the Welsbach Company's patents. The order was made on Dec. 19, 1899; and the first Mr. Reimer heard of his being committed for contempt was on the 14th of February last. After he had obtained leave to appeal from the learned Judge's order, he was it was stated, arrested at Birmingham by an agent of the Company, and detained there until he was taken to Holloway Gaol. Mr. Frank Dodd and Mr. Disturnal appeared for the appellant; and Mr. T. Terrell, Q.C., and Mr. A. J. Walter for the Company. On the conclusion of the arguments, Lord Justice Collins gave judgment. He said he was of opinion that all the necessary steps had been taken by the Company to entitle them to obtain a committal order against Mr. Reimer. If an injunction were granted against a defendant, restraining him from doing certain wrongful acts, and he, having knowledge of the fact, broke with impunity that injunction because he had not been served with a formal order, then the plaintiffs, without doubt, were entitled to move for a committal order against him. He must, therefore, hold in this case that Mr. Justice Day had exercised his jurisdiction rightly in committing Mr. Reimer to prison; and the appeal would be dismissed, with costs. Lords Justices Vaughan Williams and Romer concurred. On the application of Counsel, the Court directed that, as Mr. Reimer had been imprisoned from the 27th of February last, he should be released at once. An order was made accordingly.

### The Charge of Falsifying Books and Embezzlement.

It may be remembered that, after several remands, Frank Fairfield Norris was, on the 14th ult., committed for trial at the Central Criminal Court on a charge of falsifying the accounts and embezzling the money of his employers, Frank Wright's Prepayment Gas-Meter Corporation, Limited. The accused would, in the ordinary course, have been brought up at the sittings which commenced on Monday last week; but, at the request of his Counsel, a postponement of the trial was granted by the Recorder (Sir Forrest Fulton, Q.C.) till the next sessions.

### The Fatal Explosion at the Lillie Bridge Oil-Gas Works.

At the Brompton County Court, last Thursday, before Deputy-Judge Clement Lloyd, Mrs. Grace Clements, the widow of a gas maker, brought an action, under the Workmen's Compensation Act, 1897, against the District Railway Company, for compensation on account of the loss of her husband, who met with his death on the 23rd of December last, while in the Company's employ, under circumstances already recorded in the "JOURNAL" (*ante*, p. 40). Mr. Turrell appeared for the applicant; Mr. Disney represented the Company. Mr. Turrell explained that, if his client was entitled to recover under the Act, the amount would be £273 odd—being three years' salary. The question, however, which his Honour would have to decide was whether the man met with his death through "serious and wilful misconduct," as mentioned in the first section of the Act. It was for the other side to prove that the man had been guilty of such misconduct, and therefore he did not propose to call any evidence. Mr. Disney stated that it was part of Clements' duty to get into an oil pit, by means of a ladder, to read a gauge indicating the quantity of oil which had been allowed to run in. There was a certain amount of danger connected with this work, because the oil gave off an inflammable gas. Accordingly, a notice was placed in a suitable position warning the men against the use of naked lights. Clements went to read the gauge, and almost immediately afterwards there was a loud explosion. Subsequently his remains were found in the pit. The day in question was very dull, and it was contended that the man, in order to see the numbers on the gauge, must have struck a match, and so caused the explosion, for his Davy safety-lamp was afterwards found in his locker. Mr. G. Estall, the Resident Engineer and Locomotive Superintendent to the Company, produced a copy of the rules posted up on the works. One of them ran: "No light of any description must be taken into the purifying-rooms or engine-rooms under any circumstances." Besides this notice, all the men had a copy of Pintsch's rules, which also warned persons against the use of naked lights. Mr. Turrell read the verdict of the Jury at the Coroner's inquiry, which was to the effect that the death was accidental, but that there was no evidence to show how the naked light which caused the explosion came to be used. In cross-examination, witness maintained that neither the gas from the oil nor the gas manufactured at the works could explode spontaneously, or without coming in contact with a naked light. Other evidence of similar nature having been given, his Honour said he could come to no other conclusion than that the accident occurred through the man's own carelessness; and therefore there must be a verdict for the respondents.

### A Public Lighting Charge at Exmouth.

At the Exeter County Court last Thursday, before his Honour Judge Woodfall, an action was brought by the Exmouth District Council to recover from the Exmouth Gas Company the sum of £14 8s. 9d., alleged to have been overpaid for gas consumed in one of the public lamps. The lamp is one with three lights, and is situated on the Esplanade. The charge made was for the gas consumed. For the winter quarter of 1894, it was for 15,900 cubic feet, and for the corresponding quarters of the following years 25,600 cubic feet. In April, 1899, the Surveyor discovered that there was no meter attached to the lamp; and he refused to pass the account. Some negotiations passed between the Council and the Company, and it was agreed that the account for April, 1899, should be taken as 15,500 cubic feet; but the parties could not agree as to the previous period. The Council computed that the amount paid in excess was £14 8s. 9d.; and they asked for a verdict for this sum. Mr. W. Harding, Surveyor to the Council, said he was appointed in May, 1898, and refused to certify the account when he found there was no meter to the lamp. He was informed by the Secretary of the Company that the meter was removed at Christmas, 1894. For the defence, it was stated that a meter was originally fixed to the lamp, and for the quarter ended January, 1895, it registered 25,600 cubic feet. The following April, it was found that the index of the meter was broken; and it was agreed between Mr. Foster, the Secretary and Manager of the Company, and the Surveyor at that time that the amount charged should correspond with the previous quarters. Subsequently the matter was explained to Mr. Harding, the present Surveyor, and he assented to the arrangement. The case was tried by a Jury, who, in the end, found for the plaintiffs for £7 8s. 9d. His Honour gave judgment for this amount, and said it was a pity that there had been any suggestion of fraud in the matter. Mr. Foster and Mr. Harding were in hopeless conflict; and it was evident that one of them was mistaken.

### Stealing Gas at Stalybridge.

At the Stalybridge Police Court, yesterday week, James Beard, pianoforte and music dealer, was fined £5 and costs, or a month's hard labour, for illegally tapping a service-pipe, and using gas without the permission of the Corporation. Evidence was given to the effect that defendant had been refused a supply of gas by the Corporation because he could not find security; but he took an empty house, and was there seen by a police-sergeant burning gas. He had inserted a brass tube into the service-pipe, and carried the gas to an upper room by means of a rubber tube, so that the gas did not pass through the meter.

### Tampering with a Gas-Meter at Cardiff.

At the Cardiff Police Court, last Tuesday, before the Stipendiary Magistrate (Mr. T. W. Lewis), John Williams, of 139, Castle Road, was summoned for fraudulently preventing a meter of the Cardiff Gas Company, at 176, Inverness Place, from duly registering the quantity of gas supplied to him. Mr. Spencer appeared for the Company; Mr. Lloyd Meyrick represented the defendant. An inspector of the Company described an appliance which he found attached to the meter on the occasion of a visit paid to the premises on the 28th ult., and which prevented the meter from registering all the quantity of gas supplied. Mr. Meyrick admitted that the defendant attached the appliance, but said it was only put on temporarily for a job on which his client was engaged as a cycle repairer. Defendant went down to the Company's office and apologized for what he had done, and offered to make any reparation in his power. There was no attempt at disguise. The Stipendiary strongly censured the defendant's conduct, and imposed the maximum penalty of £5.

**The Public Lighting of the City of London.**—The Engineer to the Corporation of London (Mr. D. J. Ross), in the course of his report on the works executed in his department last year, gives, as usual, some particulars in regard to the public lighting. It appears that the number of gas-lights now in use is 1906, and 192 were defective in the past twelve months. The electric lights number 507. The question of lighting the side streets by electricity is still under consideration.

**Incandescent Gas Lighting in Lincoln.**—At the meeting of the Lincoln City Council last Tuesday, the Chairman of the Highways Committee (Alderman Pratt) read a report from Mr. John Carter, the Gas Engineer to the Corporation, on the subject of the use of incandescent gas-burners for the public lighting. Experiments had been made upon two roads, on one of which the lamps were re-adjusted on the 1st of November, and had been burning 1871 hours. All the mantles originally fitted were still in use, with the exception of three—one renewal having been necessitated by the lamp having been run against; another, by an accident while cleaning; and the third, to allow of a comparison being made between an old and a new mantle. The experiment was undertaken to test the desirability of using mantles, and to ascertain whether it was possible to adapt the existing lanterns to the incandescent system of lighting; and practically only one mantle came to grief. The lamps in the second road were fitted on the 1st of December, and the only renewal was in consequence of an injury which certainly was not accidental—for the mantle was maliciously damaged. The lights had been burning more than half the total lighting hours of the year, and they could speak with authority on their value. Three mantles a year would be ample provision. The only desire of the Committee had been that the experiments should be of the severest possible character; and he expected they would soon begin to place incandescent gas-lamps where the electric lamps stopped.

# MISCELLANEOUS NEWS.

## COMMERCIAL GAS COMPANY.

**Increase in Price—Further Capital to be Issued by Auction or Tender.**

The Half-Yearly Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. J. Blacket Gill in the chair.

The Secretary (Mr. H. D. Ellis) read the notice convening the meeting, and the Directors' report and the accounts, of which the principal portions were published last week, were taken as read.

The Chairman said he presumed the proprietors would be as pleased as the Directors were satisfied with the working of the half year ending December last. The gross income from gas had increased by £11,536, in comparison with the corresponding half of the preceding year; and when he told them that the Gaslight and Coke Company showed an increase of just upon 5 per cent., and the South Metropolitan Company 8·25 per cent., he thought the proprietors would consider their own increase of 7·9 per cent. particularly satisfactory. The meter-rents gave an increase of £94, stove-rents £150, and coin meters £826. At the present time, they had 11,778 coin meters out in the district; and these had been the means of considerably increasing the consumption. On one day during the half year (in November, he thought it was), they had the record send-out of 14½ million cubic feet—figures that had not been exceeded in the history of the Company. On the other side of the account, of course, they had had to spend more money to do more business; and their coal, cannel, and oil had cost an additional £11,235. Residuals had yielded more by £6487; so that the net cost of coals showed an increase of £4748. Purification showed an increase of £1800. The end of it was they had earned their dividends of 13½ per cent. and 10½ per cent., with interest on debentures. For this purpose they required £55,155; and after paying this sum, they had a surplus of £425. As he had said before, he thought they must be well satisfied with these figures; but naturally he was afraid they could hardly look for quite such good results for the current six months. It would be quite understood that this had not been achieved without a great deal of labour and anxiety, especially on the part of the staff, because the past winter had been an exceptionally trying one in the matter of coals. Wherever they went now, and whenever they took up the papers, they always heard and read of the war; and it put everything else out of their thoughts. So it was with gas companies; all their thoughts ran upon coal. The proprietors were as much aware as the Directors were of the great rise there had been in the price of coal. The matter rested on very many things. Possibly the war might have had something to do with it; but he thought it had mainly been brought about by the good state of trade in the country generally. He was told that coal owners preferred to sell their coal in the North, and turn it into foundry coke at 35s. a ton to make steel, than send it to London to make gas. Some months ago the Directors began to get rather anxious about the coal supply, because the collieries had been backward in their deliveries. This occasioned a great amount of anxiety to the Board, and more especially to the Engineer (Mr. H. E. Jones), as to how they should keep up a proper supply of gas during the dark and foggy days of winter. It was a trying time indeed. They were, however, getting rapidly over the trouble now, as fortunately the days were lengthening. But when he told the proprietors that the price of coal was practically double what it was this time last year, they would at once see (though the Company was only a small one, they used something like 200,000 tons of coal a year) it meant a very great demand upon them. Under these circumstances, what could the Directors do, but raise the price of their gas? There was nothing they could do that gave them greater regret. The Commercial Company had always been one that endeavoured to move with the times. They had always aimed at supplying gas at as reasonable a figure as possible, because they were perfectly convinced there was nothing better for their immediate and ultimate advantage than to supply gas at as low a figure as possible. The public were partners with the proprietors. As the price was reduced 1d., the Company were enabled to pay ¼ per cent. more dividend; and if they put up the price to the public, they lost dividend at the same rate. The Directors had determined to raise the price, from last Lady-day, by 6d. per 1000 cubic feet. There had been some talk of dividing it. He believed Mr. Livesey had thought right to raise his price only 3d. or 4d.; but, in their own case, the Directors had thought it better to grapple with the thing at once, and have done with it. Sixpence, no doubt, would be sufficient for their purposes. He hoped so; and so far as they could tell, it would be. They determined to "take the bull by the horns," and at once raise the price the whole 6d. to the private consumers. Unfortunately, however, the consumers would probably talk about fat dividends, and that sort of thing, and would consider they were hardly dealt by. It seemed to be an impossibility to make the consumers realize that, when the shareholders of a gas company got their 12 and 13 per cent., it covered the immense premiums that had been paid for shares and stock for many years, and that the shareholders did not really get more than 4 or 5 per cent. It was a most distasteful thing for the Directors to have to raise the price of gas; but they must do it for the good of the Company. All he could say was that he trusted the rise might be temporary. He hoped that, this time next year, they would get coal at something like a reasonable figure again; and then the Directors would be only too glad to lessen the price of gas to the public. He had another resolution relating to the raising of capital to lay before the proprietors; but he thought it would be better to finish the first part of the business before he touched upon this matter. He therefore moved that the report and accounts be received and adopted.

The Deputy-Chairman (Mr. W. G. Bradshaw) seconded the motion, which was unanimously carried.

The Chairman next proposed that a dividend at the rate of 13½ per cent. per annum on the old stock and 10½ per cent. on the new stock, both less income-tax, be declared. He remarked that the proprietors were aware that the authorized dividend was 13¾ and 10¾ per cent.; but ¼ per cent. went to the reserve fund.

The Deputy-Chairman seconded the proposition, which was agreed to.

The Chairman then proposed that the Directors be authorized to exercise the powers to raise additional capital conferred upon the Company by their Act of 1875, by the creation and issue of £43,125 of new ordinary stock; to exercise the powers to borrow £61,713 conferred upon the Company by the Act of 1875 and the Ratcliff Gas Act of 1855, by the creation of additional perpetual debenture stock, bearing interest at the rate of 4½ per cent. per annum; and to dispose thereof in such manner, at such times, such price, and on such terms and conditions as the Directors may think fit. He remarked that the proprietors might recollect that, at the meeting six months ago, they had a little conversation upon this matter; but no resolution was proposed. He then mentioned it to them in order that they might turn it over in their minds before meeting again. He did not wish to weary the proprietors by going into a long tale about their case; but he must recall the circumstances of their 1875 Act when they amalgamated with the Ratcliff Gas Company. At that time, the charge for gas to the consumers was 3s. 9d. per 1000 cubic feet. This was the initial figure Parliament gave them in their Act; and they were, at that price, allowed to pay 10 per cent. on their old stock, and 7 per cent. upon any new stock created. As the proprietors knew, in those times, while they were very different from what they were to-day, the coal market was kinder, the Company had very large undivided profits, and they were doing a good business. Therefore, when Parliament sanctioned the issue of the stock to the proprietors at par, the Directors fell in with that view; and the proprietors were p'eased to receive stock which commanded a very nice premium on the market. So they went on in a very happy condition for many years. This was now changed; and the proprietors were well aware that, if the Company had to compete with other Companies who got their capital at about 3¾ or 4 per cent., it was a perfectly impossible thing to do if they had to obtain their capital at between 7 and 8 per cent. The consequence was that the gist of his remarks on the previous occasion was the same as now—that they must give up the pleasure of allotting the stock to the proprietors, and must sell it at the best possible figure, and get the highest premium they could for it, to help them to carry on the war. A great deal of their stock had been allotted in the agreeable manner he had described; and they had now unallotted £43,125 of new stock, £41,713 of debenture stock, and also an odd amount of £20,000 which belonged to the Ratcliff Company, and which they could allot, at interest of 5 per cent., on mortgage or bond. These sums made a total of £104,838 unallotted. If they put this out in the market for sale by auction, or issued it to the proprietors by tender, whichever was deemed advisable, he hoped they would get a good premium for it. Supposing they got another £100,000 for it, they would have £200,000, which would carry them on for a considerable time. He thought this was a matter for congratulation. He was more grateful than he could say that they were not in Parliament this year; and they would be able to see how their friends and neighbours got on. For his own part, he thought it was a good thing they had got this money. It would last them for a considerable time; and so, he hoped, they would not have to go to Parliament for some years to come. Before that time arrived, their circumstances would no doubt get easier—coal would be cheaper again, and things would be more cheerful than they were at the present moment. Of course, the proprietors would see that their Engineer had been for many years past terribly handicapped by having to pay so dearly for his capital; and he (the Chairman) thought it redounded very greatly to his credit that there had been such a good dividend for the proprietors for so many years. There was no doubt they would have a good dividend in the future; but to get it they must have capital cheaper. This was the reason the Directors asked the proprietors to pass this resolution to give the Board authority to raise this capital, when, and at such times as, they thought fit. He might say that they were not thinking of raising any capital just at the moment, and that they had not even discussed the matter among themselves. All the Directors wanted on this occasion was to have the authority of the proprietors to issue the capital. On previous occasions, they had given the Board authority to raise £35,000 of each. This had been a little inconvenient, because they had had to call a meeting for the purpose; and he thought the proprietors had sufficient confidence in the Directors to know they would not raise money until they were absolutely compelled to do so. They had always prided themselves on being a Company that had a specially low capital per ton of coal carbonized; and they would endeavour to do in the future as they had done in the past. Certainly what he proposed was for the good and benefit of the concern; and he felt quite sure the proprietors would not hesitate to grant the Directors the power they asked for. He should like to say a few words upon another question. At the present time, the London County Council Photometer Bill was before a House of Commons Committee. They were fighting this Bill, because, if passed, it would make the inquiries into the illuminating qualities of their gas more irksome and troublesome than they had been during the past twenty years. Mr. Livesey had written a most excellent paper, which he (the Chairman) had read with a great deal of pleasure, advocating what he himself had often ventured to suggest at these meetings—that, if they could only get people to see the advantage of using gas of lower illuminating power, it would be of the greatest possible benefit to the community in general. Mr. Livesey's paper (it was put in much better language than he could express it in) pointed out quite plainly that the amount of saving to the community would be very large. Of course, if they were allowed to supply 14-candle gas instead of 16-candle gas, there would be some considerable saving in point of enrichment; and the Companies would not want the money saved. It would at once be given to the consumers in reduction of the price of gas. This was what Mr. Livesey had endeavoured to enforce in the paper he had lately published. He (the Chairman) merely mentioned it so that, if the proprietors had any power or influence with Members of Parliament or others who could help them to obtain such a desirable change, they might know they could endeavour to use it with great advantage. Abroad they might see cities far better lighted than were their own towns at home, and they were all supplied with gas of not more than 14-candle power. One satisfactory advantage was that the ceilings of the houses were not made so dirty as they would be by high illuminating gas. He could not see why the authorities still insisted upon this high illuminating quality, unless it was with the idea of making themselves as unpleasant as they possibly could. People did not seem to have much sympathy with gas companies. They had had to raise the price of their gas; and perhaps they would now get still less sympathy.

The Deputy-Chairman seconded the motion.

Mr. J. Melton Gibbs said a year ago, when the Directors last issued

to the proprietors new stock at par, a remark was made by the Deputy-Chairman that, although it was a good day for the proprietors, it was a bad day for the Company. He (the speaker) then made a few remarks rather objecting to that. It seemed to him the interests of the proprietors and the Company were identical. The proprietors were part of the Company; and since the Company in the present state of affairs—the very high price of coal and various other circumstances—could not afford to issue their stock at par, he thought the proprietors ought to acquiesce cheerfully in the proposal to issue it at a premium. He heartily supported the resolution on that ground.

Mr. BEARD suggested that it would be much better if the Directors decided upon a price at which they would issue the stock.

The CHAIRMAN said they could not do that.

Mr. BEARD added that he had bought some of the 7 per cent. stock at £150; and, as he was quite in the dark, he asked the Secretary whether he had not given too much for it. The Secretary's reply was that he had not given enough. Therefore, he thought it would be much more satisfactory to the whole of the shareholders if a price was fixed.

The CHAIRMAN: We could never fix a price that would be agreeable to all the shareholders.

The DEPUTY-CHAIRMAN: It will be issued by auction or tender.

Mr. ENNIS observed that apparently the sole reason for issuing the stock in the manner proposed was that it would keep the Company out of Parliament some time. To his mind, in a great many senses, the proprietors were thoroughly entitled to the privilege accorded to them by Act of Parliament—that was, the distribution of this stock among them at par. He understood that the last proprietor who spoke had given a high premium for stock, and that premium was partly given as consideration for the benefit of having stock allotted to him at par. What was proposed was that they should present to the consumers, who were partners with the proprietors (by reductions, the Chairman showed, at a recent meeting, they had received an immense sum as against only a small fraction in the case of the proprietors), something like £100,000; which the shareholders ought to have as a sort of let-down for the high price they gave for their stock. The proper thing to do was to go to Parliament, when they had allotted the present stock to the proprietors, and ask them for an extension of the capital. They would have to do so some day; and then, even if they had done as the Directors proposed, Parliament would not give them the slightest credit for it. They would cut them down in price in every possible way. Perhaps the Chairman could inform them how far the £100,000 and the £200,000 would carry them. The capital account was now overdrawn to the extent of between £2000 and £3000. He thought it unreasonable to deny themselves the privilege they possessed.

Mr. QUICK suggested that, if the stock was offered to the shareholders by tender, it would give them something in the nature of a *quid pro quo* for what they lost.

The CHAIRMAN pointed out that they took power to either offer it by tender or auction, whichever they might consider the best at the time. Latterly, better prices had been obtained by auction.

Mr. QUICK pointed out that Mr. Livesey suggested, at the last meeting, that the Company should appeal to Parliament and try to get an equivalent for what the proprietors were giving up.

The CHAIRMAN replied that they might go to Parliament with the £100,000 in their hands; and they would only get it taken from them. As to Mr. Ennis's remarks, they could not bind themselves as to the time the £200,000 would last; but it ought to suffice for a considerable period. Really the whole question was just as broad as it was long; for if they had to work with high-priced capital, they would not get anything like the 10 or 13 per cent. that they had been enjoying for years.

Mr. NEVILLE inquired whether the Directors' proposal was legal.

The CHAIRMAN assured him that they had satisfied themselves on that point. Mr. Hollams—than whom there was no better authority in the City—had gone thoroughly into the matter.

On being put to the vote, the resolution was adopted.

A vote of thanks having been passed to the Chairman and Directors,

The CHAIRMAN responded; and, in the course of his remarks, he stated that, had Mr. Livesey been present, he would have entirely endorsed the policy of the Board in regard to the issue of further capital. He concluded by proposing a vote of thanks to the chief officials and their staffs.

The motion having been cordially agreed to,

Mr. H. E. JONES, in reply, said there had never been a time when the staff so much needed a little encouragement such as had just been given for the past half year. But that had been a comparatively easy period compared with the six months in front of them. They were in a tight place with these high prices for coal—higher prices than they had given for the last eighteen or twenty years. There were, too, a good many considerations to restrain them from increasing the price of gas. It encouraged the competition which was threatening them; and it was also essential that they should keep their best friend and customer in good humour. They would certainly have to sit tight and ride hard during the next six months. As an old parliamentary hand, he congratulated the Directors and the shareholders on having done something which would prevent them being obliged to meet a Parliamentary Committee for a few years longer. These Committees were most uncertain tribunals, although the general disposition was to act fairly and with good commercial sense and prudence. Gas companies, however, were not the highest favourites of Parliament. The popular supposition was—and it was only a supposition—that gas companies were wealthy and plethoric concerns, who could be easily bled a little without doing much harm. That being the atmosphere, he was happy they would not have to breathe that atmosphere for some time yet, owing to the proprietors' prudence. They had enjoyed the privilege of having stock allotted at par for 25 years now. It was an almost exclusive privilege so far as gas companies were concerned. It had not been given to another gas company after the Commercial Company got it; and they only obtained it by striking a quick bargain—by taking the sliding-scale from Mr. Forster's Committee. While the proprietors had enjoyed this privilege, it had not been nearly such a matter for enjoyment to those of the Company's officers and servants who had had to provide the dividend, and at the same time sell gas 6d. lower than it was sold at the present time in the City, and with the very active spur in their side to catch up to Mr. Livesey, who supplied gas at 4d. lower on the other side of the water.

Mr. ELLIS, in replying, also congratulated the proprietors upon having passed the resolution in regard to the issue of future capital. It was, he said, a subject to which he had given a great deal of attention for some years past. He was perfectly certain, by resolving to issue capital on the cheapest terms in the future, the proprietors had added to the strength of the existing capital they held; and therefore they had to a certain extent guaranteed the continuation of the dividend so far as it might be maintained, having regard to the price of gas. He for one would leave the meeting with the comfortable conviction that, through the proprietors' action that day, his stock was well worth more to him. He did not say the price was going up on the Stock Exchange; the Stock Exchange did not always look at the true inwardness of things.

## ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on the 31st ult.—Mr. C. LAWLER, J.P., in the chair.

The notice convening the meeting having been read, the report of the Directors, with the statement of the accounts, the principal items in which were given last week, was presented.

The CHAIRMAN, in moving the adoption of the report, said the Company had carbonized 5146 tons of coal more in the six months covered by it than in the corresponding period of 1898, and made 36,314,000 cubic feet more gas; they receiving £6441 8s. 10d. more for the quantity sold. The Directors attributed this to the increased number of cookers, heaters, &c. (1800 additional appliances being fitted during the year, and the demand continuing), and to the dark, cold weather of December. Residuals maintained their price. The Company received £4244 14s. 1d. more for coke than in the corresponding period of 1898. Sulphate of ammonia had brought in £760 5s. 6d. more, and tar £1876 16s. 1d. more. In common with other gas companies, they had experienced some difficulty in obtaining their monthly deliveries of coal from their contractors in the time agreed. The contractors said it was impossible to get it owing to the exceptional demand for manufacturing and other purposes. As the result of the non-delivery of their coal, the Directors had to purchase some cargoes at a much higher price than the contract figure. The Company's new premises in Grafton Street, for the sale of cooking and heating apparatus of every description, also gas-fittings and incandescent mantles, had been open for some time. They were handsomely fitted up, and were well worthy of a visit from the public.

Mr. J. R. WIGHAM seconded the motion.

Mr. CREAN asked the Managing-Director to make a statement on the subject of water gas, about which so much had been heard.

Alderman COTTON, J.P., in complying with the request, said in the first place there was evidently an attempt being made to create a scare in Dublin over the matter; and it would seem that it was being done by parties interested either in electric lighting or in acetylene. It was alleged that the introduction of water gas was something new. He granted that it was, because Dublin had been behind the times for some years. In London, however, an installation was started in 1891; and from the first the plant they put up was capable of making 12 million cubic feet per day. At present, London was supplied at the rate of 35 million cubic feet per day. The apparatus of the Alliance Company was only capable of producing a million cubic feet daily. In order to show the extent to which this manufacture was carried on in other places, he would give a few statistics. In Belfast, for instance, they were capable of supplying, and did supply last winter, up to 5,300,000 cubic feet per day; and in Liverpool, 8,000,000 cubic feet per day. In Birmingham, where the gas-works were corporate property, they supplied as much as 8,000,000 cubic feet daily; and in Edinburgh, 2,000,000 feet. The Alliance Company were the last to take it up. As he had stated already, there was nothing new in water gas. The Company sent their plans to the Corporation previous to starting it; and before they obtained permission to erect their works, the Electric Lighting Committee of the Corporation submitted their plans to the Public Health Committee, and there followed a long correspondence on the subject. The matter was put into the hands of Sir Charles Cameron, and he reported in favour of allowing the Company to supply water gas that would not contain more than 20 per cent. of carbon monoxide. Although it was stated on the previous day, at the proceedings in the City Hall, that they had not the sanction of the Corporation, they certainly had it, and had the correspondence in their possession to prove it. The use of water gas was now universal. The President of the Board of Trade stated a few days ago that in America they were using 70 per cent. of it; while up to the present they in Dublin were not sending out 6 per cent., notwithstanding all the cry that was being got up about it.

The CHAIRMAN said that, after the statement of Alderman Cotton, he need scarcely add anything. In London, Manchester, Birmingham, and Plymouth—the last-named being one of the most healthy towns in the kingdom—they used water gas largely, and the death-rate was gradually going down, instead of increasing. He did not suggest that this was caused by the use of water gas; but it showed, at all events, that the effect of using it was not to increase the death-rate.

The report was unanimously adopted, and the dividends recommended were declared.

The resolution passed at the last meeting, increasing the salary of the Secretary to £600 per annum, was confirmed without discussion.

A cordial vote of thanks was passed to the Chairman, Directors, and staff, and the proceedings closed.

## SAN PAULO GAS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Friday, at Winchester House, Old Broad Street, E.C.—Mr. D. M. Fox presiding.

The SECRETARY (Mr. G. H. Rogers) read the notice calling the meeting, and the report and accounts, referred to last week, were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said that for some years prior to 1897 the Directors had considerable anxiety in connection with the negotiations for the new contract; but the difficulties they had had to contend with during the period under review had, perhaps, been even greater, owing to changes made in the laws

regulating the electric light and the depression existing in San Paulo consequent on the unsatisfactory condition of the coffee trade. As to the receipts, an increase of £689 was shown in public lighting, owing to 94 additional lamps having been erected; making the total at Dec. 31 last 3214. In the sale of gas for private lighting, there had been a falling off of £6814. This decrease was not owing to the competition of the electric light, except to a small extent. The main cause was the temporary falling off in the prosperity of the City of San Paulo. The actual number of private consumers was 4784 against 4876 in 1898, a reduction of under 2 per cent.; but it was apparent that economy had been exercised in the use of gas, as the quantity consumed was less by 6 per cent. With the revival of the coffee trade, of which there were already indications, there would be a return of prosperity to San Paulo. The item of residual products was practically the same as in the previous year, £417. On the expenditure side, coal showed a reduction of £3242; the sale of gas to the private consumers having fallen off, 1583 tons less were carbonized. Repairs and maintenance, including materials and labour, stood at £3416, against £2747 in 1898. The £3416, however, included £1062, the expense of moving a coal-store. The old store was 400 yards distant from the retort-houses; and this involved continual expense and inconvenience in the transport of the coal. The cost of the land for the new store, £2444, had been carried to capital account. Under the head of distribution, there was an increase of £1330. For some time the State Authorities have been carrying on extensive works of sewage and drainage in the city, causing a considerable disturbance of the gas-mains, with a consequent increase in the gas unaccounted for. To remedy the defects in the mains, a larger number of men had been employed than usual, with the result that the leakage had, during the past year, been reduced by 2⅓ per cent., as compared with 1898. For the first time in the Company's history, the Government had for the period under review, imposed an income-tax on the dividend; and there was no alternative but to pay the £970 demanded. For some time the Board had been anxious to push the incandescent burner, but had been hampered, because the patent rights for the State of San Paulo were held by a Brazilian firm, who imported mantles and burners that did not give satisfaction. After some negotiation, the Directors had acquired for the Company those patent rights for £622; and the Welsbach Company here had agreed to supply them with their improved burners and mantles on advantageous terms. A store had been opened in San Paulo for their sale; and the Directors had every reason to be satisfied with the result of the first four months' business. They believed that, with the proper use of these burners, gas would hold its own against the electric light. In connection with this department, the use of gas-stoves for cooking and heating was also being introduced. After referring to the capital expenditure, amounting to £5192, and to the effect of the rate of exchange on the remittances from Brazil, he said that the electric light question had caused the Board much anxiety. It was mentioned in last year's report that, having the offer of lighting the new railway station at San Paulo by electricity, the Board had decided that it was a favourable opportunity for starting an electric light works. This business was approached with the greatest caution; and it was not until they were assured by their legal adviser that the Company had the right to supply the electric light under their contract, and that the President of the Camara Municipal was favourable to their doing so, that the Directors would in any way entertain the idea. Within six months of entering into the contract, and when the plant was nearly ready for shipment, the Camara Municipal passed a law for regulating the supply of the electric light in the city, the conditions of which were so onerous that the Company had no alternative, but to cancel the contract and throw up the business. The Board paid £2200 to get rid of the Company's liability under the contract; and he thought they acted wisely in cutting the loss. As it was important that the new railway station should be efficiently lighted on its completion, the Railway Company had arranged to light it on the intensified gas system. With regard to the coal supply, they had contracts which would carry them nearly through the current year; but it was alarming to think that the present price was 16s. 6d. per ton for coal for which they were now paying 9s. 3d., and which in 1896 cost only 6s. 6d. The Directors' attention had been directed to improvements in the producing plant with a view to cheapen the cost of manufacture, and the Consulting Engineer (Mr. A. F. Phillips) had in hand the alteration of the retort-settings, so as to bring them up to the most modern standard of efficiency. As to water gas, there were difficulties in the increased cost of oil, and of duties, and of the storage and transport of the oil that appeared insuperable; and, therefore, for the present, this projected improvement had been postponed.

Mr. J. R. Tyndale seconded the motion.

Mr. W. C. Fowler felt it was a misfortune that the shareholders were to receive only 8 per cent., as against 10 per cent. in the previous year. In a foreign Company like this, the shareholder had a right to expect 10 per cent. The Company had been shamefully managed in former years; but he considered it was well managed now.

After further discussion, the motion was unanimously adopted.

The proposed final dividend of 3 per cent. per annum, free of income-tax, making, with the interim distribution, a total of 8 per cent. for the year, was approved.

The retiring Director (Mr. John Barker) and the Auditors (Messrs. Cash, Stone, and Co.) were re-elected.

The usual complimentary votes concluded the proceedings.

**Darlington Gas and Water Supply.**—At the meeting of the Darlington Town Council last Thursday, Alderman Barron, in presenting the accounts of the Gas Department, said the Committee had determined to hand over, in relief of the rates, the whole of the balance of profit on the year's working, amounting to £5900, or £726 more than the previous year. This mostly arose from an increase in the number of consumers; but it was also very satisfactory to find that they had brought their loss by waste down to 3½ per cent., which practically meant that they were paid for all the gas they were making with the exception of this percentage. It was an interesting fact that since the gas-works had come into the possession of the Corporation, they had contributed something like £75,000 towards relieving the rates. The profit had gone on steadily increasing; and he hoped it would continue to do so. The minutes presented by the Water Committee showed that the profits had been £7811; being £653 more than before.

## INCANDESCENT GAS LIGHTING IN SOUTHWARK.

At the Meeting of the St. Saviour's (Southwark) District Board of Works last Wednesday, it was reported that the Secretary of the South Metropolitan Gas Company (Mr. Frank Bush) had written stating he regretted to receive complaints from the Board as to the mantles of the incandescent gas-lamps in the streets being defective. The Company's lamp inspector had been instructed to inquire into the matter. Several members expressed the opinion that the Company did not renew the mantles as promptly as they might do; and one said the lighting was worse now than it was before the incandescent system was introduced. (No, no.) Mr. Puxty said he did not think it would be seriously contended that there had not been an increase of light through the introduction of the system. At the same time, the Company should be kept up to their contract, and an allowance should be made for any lamps that were out. Mr. Southerell generally agreed with the last speaker; remarking that there could be no two opinions as to the value of the change from the old burners to those now in use. The Surveyor thought the mantles were generally broken by children fixing ropes on the lamp-posts and swinging round them. In the result, it was resolved to communicate with the police as to this practice; and it was further decided that the officers of the staff should endeavour to keep a record of the time lamps were left extinguished at night. On the same occasion a letter was read from the Company notifying that, owing to the great increase in the cost of coal, the price of gas had been raised from 2s. 1d. to 2s. 4d. per 1000 cubic feet. Owing, however, to the Board having entered into an agreement with the Company with respect to incandescent lighting, the charge for gas for the street-lamps in St. Saviour's district would not be raised.

## MANCHESTER CORPORATION GAS AND ELECTRICITY SUPPLY.

At the Meeting of the Manchester City Council last Wednesday, the minutes presented by the Gas Committee were adopted without discussion. These consisted chiefly of the acceptance of tenders for new plant required at the various works, including two Lancashire boilers and a station meter at Bradford Road, fire-clay goods for the Droylesden works, and two standard test gasholders. Tenders were also accepted for the maintenance of the photometers at the several works, and for the purchase of the spent oxide produced during the ensuing year.

The minutes of the Electricity Committee, which were also adopted without amendment, contained a resolution to the effect that the corporate seal should be affixed to the agreement with the Urban District Council of Audenshaw, transferring their Electric Lighting Order to the Corporation, and that the Town Clerk be instructed to take the necessary steps, and give the requisite notices, for obtaining the approval of the Board of Trade. In a further resolution, the Finance Committee were requested to make application to the Public Works Loan Commissioners for a further instalment of £35,000 on account of the loan of £181,610 for electricity purposes.

## LEEDS CORPORATION GAS SUPPLY.

### The Coal Difficulty and the Quality of the Gas.

At the Meeting of the Leeds City Council last Wednesday, on the presentation of the minutes of the Gas Committee, Mr. Henry called attention to the illuminating power of the gas, as shown by the report of the Justices' Inspector (Mr. C. Buckley). He complained that, according to this gentleman's tests, the illuminating power of the gas had been below the standard for the past four months. The present, he said, was not an exceptional time, to account for such a state of things; and he would like to hear what explanation the Chairman of the Gas Committee had to offer. The standard required by the Council, in accordance with a resolution passed in 1893, was 18½ candles; the minimum not to be below 18 candles. From figures available, it appeared that during the past month Mr. Buckley had made 46 tests, of which only 15 were within the standard—one test, it appeared, being actually below 16 candles. He submitted that it was unfair to the ratepayers and to the gas consumers to allow the illuminating power of the gas supply to be lower than the required standard. Alderman Lowden remarked that Mr. Henry knew and appreciated the reasons for the low illuminating power of the gas. He was perfectly well aware that, under the circumstances of the last few months, it was impossible to maintain the 18-candle standard. The whole kingdom knew the trouble there had been in producing gas of the required standard, and in some cases in making the requisite quantity. Every large city and town in the country—Sheffield, Manchester, Liverpool, London, and other places—had experienced the same difficulty as Leeds, and even in a much greater degree. In Leeds they had been most fortunately situated. As far as he knew, no city in the kingdom had shown the foresight of Leeds in having so large a stock of coal in hand. They had done everything that was humanly possible. Of the eight Liberal members of the Gas Committee, not one raised his voice in criticism of the management of the Gas Department; and he cordially thanked them for their loyalty. There were various reasons for the deficiency in the illuminating power of the gas. The first was the difficulty of obtaining cannel coal. By their contracts, no less than 11,000 tons were due in December, but they were able to obtain only 4500 tons; in January, close upon 11,000 tons were due, and they received 6354 tons; and in February, 8060 tons were due, yet they had only 4822 tons. In other words, just about half of what was due during those three months was actually delivered. Then there was a difficulty in procuring cannel hub, 7000 tons of which were due; but until the last week or two they were unable to obtain deliveries, as the seam had run out, and the colliery proprietors had been to see what terms they could make with the Committee. There was another reason. The Corporation had during the last few years built large stores, capable of holding 40,000 or 50,000 tons of coal. For the cost of those buildings, the Corporation had already been rec[illegible]

in consequence of their having been able to stack coal bought at a low price compared with that they would have to pay to-day. During the past few months, they had not used any of the coal in those stores; they had used some which had been stacked in the open—some of it for years—and which, having been exposed to the weather, had considerably deteriorated in quality. In the three months of December, January, and February, 24,701 tons of this coal had been carbonized. It had been tested, and it was found that its illuminating power was 14½ candles at the New Wortley works, 14 candles at Dewsbury Road, and 13½ candles at York Street. Moreover, there had been the scarcity of coal, and the Committee had been obliged to accept that which was not equal to the samples, though, of course, they had made claims when it was below the stipulated quality. These reasons, he contended, were satisfactory; and, under the exceptional circumstances, censure was unjustifiable. He added that during the six months ending June 30, 1893, when the Radicals were in power, and when the standard was 19 candles, the average illuminating power was 0·93, or nearly 1 candle, below the standard; while of the six testing-stations, the worst results were at Meadow Lane, which was under the control of the Committee of which Mr. Henry himself was Chairman—the illuminating power of the gas being 17·84, instead of 19 candles, and this at a time when there was no difficulty in getting adequate supplies of coal in regard to either quantity or quality. The minutes were confirmed.

## THE ROTHERHAM CORPORATION AND CARBURETTED WATER GAS.

At the Meeting of the Rotherham Corporation last Wednesday, a recommendation of the Gas-Works Committee, that the Consulting Engineer be instructed to report on the advisability of providing more storage accommodation at the gas-works, and further on the desirability or otherwise of putting down an installation of carburetted water-gas plant, gave rise to some discussion. Alderman F. Mason, with the consent of the Mayor, and without moving a special resolution, criticized the recommendation. He said the reason he did not move the striking out of the latter part of the proposal was that the conditions now were different from what they were three years ago, when the subject was discussed by the Council, and abandoned. A Government Department had since proposed restrictions. He did not object to a report being submitted, but, so far as he was concerned, anything that would affect the public health would be opposed. He had no doubt the Engineer would take cognizance of the fact, and would not recommend the putting down of plant where the mixture of the two gases would exceed the regulations. He thought the time had come when something should be done to improve the supply of gas. They had expended enormous sums for this purpose, and the gas was still unsatisfactory and universally condemned. The smell was offensive, and the illuminating power grossly inadequate to the requirements. He knew he was treading upon dangerous ground, because the Mayor (Mr. G. Gummer) had taken the initiative, and the Council had decided to spend no more money until present schemes were completed. They had, however, voted gas profits to provide Turkish baths; but he thought if the money had been spent in improving the quality of the gas it would have been better. He hoped the Engineer's report would not seriously prejudice the health of the community, or more would have to be said upon the question. Mr. Cox said the subject had been investigated by a competent authority, and he did not see why Alderman Mason should get up and suggest that the Corporation were going to commit a breach of the law, or do anything that would run counter to orders. So far as he could see, the only object of Alderman Mason was to discredit what in his (Mr. Cox's) opinion was a most justifiable, economical, and wise course of the Gas Committee in regard to the condition of their plant. The Mayor said the debate was rather out of order; but he had given Alderman Mason permission to make a few remarks without moving an amendment. He had not for one moment anticipated that their object had been what it had turned out to be. He took it that the Alderman was not the only gentleman in the Council desirous of looking after the health of the people; and it was not necessary therefore for him to say he should oppose the introduction of carburetted water gas, if it were detrimental to the health of the borough, any more than the other members of the Council. The health of the inhabitants was not altogether in the keeping of the Chairman of the Health Committee. So far from carburetted water gas being prejudicial to health, since the matter was discussed by the Council three years ago plant for making the gas had been installed in many places which were really health resorts. Further, Alderman Mason seemed to have had another object, and that was to make an attack upon the management of the gas-works. He (the Mayor) saw no reason why that gentleman, in referring to the Committee's minutes, should have spoken about the enormous sums spent, and the inadequacy and poor quality of the gas supply. These were general statements of which there were no proofs. Defending the action of the Gas-Works Committee, he said he believed they were entirely of opinion that when the improvements were thoroughly carried out, they would have model works which would serve the requirements of the town for some little time. The extensions and the great demands on the department necessitated either more storage or the installation of some method of producing gas quickly, as proposed. Additional storage would incur an expenditure of from £20,000 to £25,000; and with the present high prices of materials and labour, the Committee were of opinion that it would be better to defer the construction of more gasholders for a time, and put in some other kind of plant. The recommendations were approved.

**Dorking Gas Company.**—The 58th half-yearly meeting of this Company was held on the 27th ult., when it was reported that there was a balance available for distribution of £2573. The recommendation to pay the maximum dividend on all classes of the shares was agreed to. This absorbed £1039, and left a balance of £1534 to be carried forward. Mr. William Cash, of London, was appointed Auditor, in place of the late Mr. F. Durant. At an extraordinary general meeting, the Directors were authorized to issue 144 additional "C" shares of £25 each, at a premium of £10, to be allotted to applicants from among the shareholders.

## THE GAS POISONING CASE AT PLYMOUTH.

An Inquest was held last Tuesday, at East Stonehouse, by Mr. R. R. Rodd, on the bodies of the two men—Frederick Bennett, 27, stoker in the Royal Navy, and Thomas Ash, 77, naval pensioner—who, as reported in the last number of the "Journal," were suffocated by gas at a refreshment-house where they slept on the previous Saturday night.

*William Henry Colwill*, the keeper of the house, said that Ash had lodged with him for five or six months. He went to bed about nine o'clock on Saturday, the 31st ult., and Bennett, who came in about 12.30 a.m., was put in a spare bed in the same room. He was sober. There was no light in the room when Bennett went to bed, but there was light enough from a gas-jet outside to enable him to see. Witness did not light the gas. There was no fireplace in the room, which was about 10 feet long, 8 feet wide, and 8 feet high. The gas was laid on to the room about six or seven years ago. The fittings were gas-tight; but the tap turned easily. Before going to bed, witness went round the house, and saw that all the lights were out except those in the passages. They did not call the lodgers on Sunday mornings, and it was after twelve o'clock when witness went to the room occupied by the two men. On opening the door, he found the place full of gas and both men dead. There was a window in the room; but he believed it was closed. Those who occupied the room often closed the window; and Ash generally did so.

The Coroner commented on the smallness of the room, which was, he said, a mere box of a place.

*Witness* said there was space for two men to sleep, according to the regulations.

The Coroner also pointed out that the gas-tap was very loose. A stranger might turn it off and partly on again without knowing it.

*Witness* said that, to his knowledge, the gas was not lit on the night in question. It was possible Bennett caught the tap with his clothes in undressing. He could not have touched it with his foot after going to bed.

A private in the Royal Marine Light Infantry, who occupied the next room, said he did not hear any noise in the night, nor did he smell gas.

Mr. *W. H. Waterfield*, surgeon, said he was called to the house at 12.40 p.m. on Sunday, and saw the bodies of the two men in the bedroom. There was a strong smell of gas in the room. The men had been dead from four to five hours. There was no leakage of gas if the tap was properly turned. There was a stop on, but the tap worked loose. The window of the room was closed, and with the door shut there was no outlet whatever for the gas. A *post mortem* examination showed that both men were healthy. Death was due to asphyxia, caused by coal-gas poisoning. The burner would give out about 5 cubic feet of gas per hour. If there were an amount of water gas, death would take place sooner; but if there had been only coal gas, the result would have been the same. The room was about 8 feet square, and its cubical contents 640 feet. He did not know what the authorities in East Stonehouse considered necessary; but sanitarians said that for two people sleeping in one room there should be 3000 cubic feet of fresh air per hour. If the room had been two or three times as large as it was, the pouring into it of so much gas would have produced death, but it would have been slower. The room was practically air-tight.

The Coroner said that, as the room had no fireplace or other means of ventilation, it was very questionable whether gas should have been laid on; but, a supply having been provided, care should have been taken to see that the fittings were perfect. The tap, however, worked very easily indeed; and it was probable that Bennett by some means turned the gas on.

A verdict of "Accidental death" was returned; and, on the recommendation of the Jury, Colwill promised to take down the wall between the room in question and the next, and to discontinue the use of gas in that part of the building.

## OLDBURY GAS UNDERTAKING.

The Monthly Meeting of the Oldbury District Council was held last Friday—Mr. W. T. Davies presiding. Mr. J. W. Wilson, M.P., moved the adoption of the annual statement of the gas accounts, some extracts from which were given in the "Journal" last week. In doing so, he congratulated the Council, as well as the Manager and the Gas Committee, on being able to show a statement with so substantial a profit as £1700, considering the circumstances. The year had been a good one, from a manufacturing and selling point of view. During the past three years, the gas consumed had risen from 91 to 106 million cubic feet; coal cost more; and the manufacture of gas showed an increase of £500. The expenses of distribution had been somewhat heavier, by reason of their having to take up mains and put down new ones; but, on the other hand, the £1400 more on the manufacturing side was balanced by £1400 on larger sales and returns from residuals, which enabled them to realize the same amount of profit as in the previous year. They had not paid the full increase on their coal, owing to the policy they had adopted of having heavy stocks in hand; for while some works had been with only two weeks' supply, they at Oldbury always had two or three months' stock. The profit and loss account showed £300 less net profit; but this was because they paid £200 more in relief of the rates, and gave £50 towards the Technical Institute. They did not at present propose to raise the price of gas, as had been done in many places, but to apply £300 at once in reduction of the rates, and £300 more in the autumn. It was the aim of the Committee to maintain a moderate grant like this, which was better than going into four figures one year and dropping the next. The motion was carried.

**The Condition of the Water Supply of Pudsey.**—The Medical Officer of Health of Pudsey (Dr. W. L. Hunter) makes some startling statements as to the impure condition of the water supply of the town during last year. He says the supply was so unsatisfactory that, if an equally dirty effluent were turned into a stream from sewage treatment works, the Yorkshire Rivers Board would not accept it. The impurity of the water is illustrated by photographs, which are said to show the difference between Bradford water and clean water.

## ELECTRIC LIGHTING NOTES.

The Electric Lighting Committee of the York City Council have advised the extension of the electricity works at a cost of £20,000; and the Council have authorized an application for the sanction of the Local Government Board to the borrowing of that sum.

An increase of from £20 to £22 10s. per annum is to be made by the Torquay Electric Lighting Committee in the charge for the lighting of the arc lamps in the streets. In spite of this and some other economies, the estimate for the current half year is that the undertaking will only barely pay its way.

In connection with the Lancashire Electric Power Bill, the Town Clerk of St. Helens has been instructed to write to the Lord Mayor of Manchester, pointing out that, if the clauses are inserted in the Bill for the protection of boroughs, which it was understood as the result of the debate on second reading would be inserted, making the Council's consent a condition in respect of the route of "through" cables and the supply within the boroughs, the Corporation of St. Helens would be satisfied not to oppose the preamble of the Bill.

At the meeting of the West Hartlepool Town Council last Tuesday, the Electric Lighting Committee were authorized to increase their borrowing powers by £19,000, for the purpose of carrying out extensions of mains, &c. It was stated that the Free Library had been equipped ready for the installation of the electric light. The Engineer is to report upon the cost of lighting by electricity the Municipal Buildings, County Court, Market, and Abattoir; and hopes were expressed that before long the Town Hall and the Technical Schools would be included in the scheme.

The Epsom Urban District Council have adopted a somewhat novel method of raising a loan of £16,100 for the purpose of meeting the cost of the introduction of the electric light. When the question was first under discussion, it was calculated that the money could be obtained at the rate of 3 per cent. or less. Owing to the changes which have since taken place in the Money Market, the rate of interest has increased; and, with a view of keeping the expenditure at the lowest possible figure, the Council have obtained the sanction of the Local Government Board to the issuing of 322 debentures of the nominal value of £50 each, on the security of the rates. These are to bear interest at the rate of 3½ per cent.; and their redemption will be made within 23 years from the date of issue by means of 23 annual drawings of £700. The matter came before the Council at their meeting last week, when the members unanimously approved of the scheme.

Last Friday, deputations from the Vestries of St. George-in-the-East, Limehouse, and Mile End Old Town attended before the Board of Trade to have their Electric Lighting Provisional Orders confirmed. They were opposed by the County of London and Brush Provincial Electric Lighting Company, who already have an Order to enable them to supply electricity in those Vestries' districts, but have not begun to do so. The three Vestries argued that in November next they would be joined with Whitechapel, which had an Order, and would form the new borough of Stepney, and that this private Company should not be allowed to compete. Sir Courtenay Boyle, after hearing the parties, reserved his decision; saying that, supposing the Orders were granted, they should all conform to the provisions of the Whitechapel Order, so that, under the London Government Act, the new Municipality of Stepney should have identical provisions over the whole borough.

According to a report presented by M. Toukoff to the Congress of Electricians which was recently held in St. Petersburg, the first electric light installation in the city was put up in 1882; and now there are 284 private ones and 10 central stations working under contract with the Municipality according to authorized rates, and with the exclusive right to utilize the streets for power-distributing purposes. Four of these stations belong to the first Electric Lighting Company (the Belgian Company) and the Helios Company. They supply 587 private and 387 public arc lamps, and 212,000 incandescent lamps belonging to 5000 customers, along a length of cable extending 491 miles. The 294 stations comprise 408 steam-engines and 98 gas-motors, having altogether 50,906-horse power, and working 502 dynamos. The total number of arc lamps is 3317, and of incandescent lamps 451,951, half of which are supplied from private stations. The total number of employees in connection with the electric lighting is 1212.

The works erected by the Doncaster Corporation for supplying the centre of the town with the electric light and to furnish the motive power for driving the tram-cars to the outlying places were opened yesterday week. The first engine was started by the Mayor; and the light was switched on by the Mayoress. His Worship made an interesting little speech in the course of the proceedings, tracing the development of artificial lighting in the borough. He said that in 1764 the Corporation decided to illuminate the town with oil-lamps; and the cost of oil, lighting, &c., was £131 per annum. In 1827 the old Gas Company was formed, the Corporation being shareholders. They erected works at a cost of £11,600; and the undertaking was subsequently purchased by the Corporation at a cost of between £16,000 and £17,000. In 1899, the same works —of course, with enlargements—were put down in the Corporation accounts as worth £66,000. But the old Company was not the first to introduce gas in Doncaster. In 1814 an enterprising whitesmith named Elliott manufactured gas on his own premises; and in 1815, on the reception of the news of the victory at Waterloo, and also on the declaration of peace, he illuminated his house. What they were witnessing that day was only a portion of the Corporation scheme. In the entirety the Corporation would spend about £100,000. The works had been so constructed that they would be able in the future to command any supply. The remaining £70,000 was proposed to be expended in the provision of electric trams.

A rather warm discussion took place at the meeting of the Salford Town Council last Wednesday, on the proceedings of the Electric Light Committee coming up for consideration. Owing to certain alleged irregularities which had occurred in connection with the placing of the contracts for the electric light station, the Chairman of the Committee (Mr. A. Haworth) decided to resign his position. On the matter being referred to by the Mayor (Alderman Rudman), the Town Clerk explained that the plans for the new station, with regard to which the dispute had arisen, were in the hands of an expert, and would be back by the following Monday, after which the whole of the facts would be prepared, and a General Purposes Committee meeting could be called to consider them. It was decided to suspend the standing orders, so that Mr. Haworth might have an opportunity of giving some explanation to the Council. This he did, and concluded by moving that the Electrical Engineer (Mr. C. L. Turner) be forthwith requested to send in his resignation. Mr. Bates having seconded the motion, Alderman Phillips said they had to consider the dignity of the Council, and to do justice. They had heard a very grave statement from the Chairman of the Committee; and the question was whether or not Mr. Turner was faithfully discharging his duties. He thought the best course for the Council to take was to appoint a Special Committee to thoroughly investigate the whole matter; and he moved an amendment to this effect. Alderman Mandley seconded the amendment. Alderman Snape characterized the amendment as practically a vote of censure upon the Electric Light Committee. After some further remarks, Mr. Haworth withdrew his motion, and the amendment was carried; the Special Committee being appointed.

Alderman T. B. Sanderson presented, at the meeting of the Newcastle Town Council last Wednesday, a report from the Watch Committee, recommending that certain streets should be lighted by electricity, and that application should be made to the Local Government Board to sanction the borrowing of £10,000 to meet the necessary capital expenditure. He moved the adoption of the report; but this was objected to—several members claiming that it should stand over till next month. It was resolved, however, that the report should be taken. Alderman Sanderson said that to light the whole of the tramway routes with electricity they would require 373 lamps, at £18 per lamp, amounting in all to £6714. The charge for gas being £2541, the extra cost of electricity was £4173. To light the centre of the city they would need 180 lamps; but they would put out 380 gas-lamps and 18 of the electric-lamps, and would get four times the amount of light, at an extra cost of £1726. The total cost was £7750; but they desired to provide for extensions, and they asked the Council to give them permission to apply for sanction to borrow £10,000. Several members complained that the outskirts of the city had been neglected in the lighting scheme; but it was replied that it would be well to experiment in the centre of the city with the electric lamps, before considering a scheme for the lighting of the whole area. Mr. Gillespie said that, if the lighting in the proposed streets was successful, no doubt the Committee would recommend its extension to the other parts of the city. Alderman Sanderson stated that the streets in which they proposed to put the 180 lamps were now lighted by 380 gas-lamps, at an annual cost of £758, and the 18 electric lamps which cost £756; making a total annual cost of £1514. The illuminating power of the existing lamps was 47,000 candles; the power of the electric lamps would be 180,000 candles. The report was adopted.

At the recent annual meeting of the Folkestone Electricity Supply Company, Limited, the Chairman (Alderman G. Spurgeon, J.P.) said the capital expenditure during the year had been £21,400, increasing the total outlay to over £64,000. The capital was only £54,000, and the Directors had decided to issue £25,000 of debentures at 4½ per cent. They had had an unprecedented number of applications for electric current during the year, and found they were unable to go on satisfying the demand unless they made provision for additional new machinery, and for the extension of the buildings. The Directors had not expected to have to make arrangements for extensions so soon. When they started, they considered that provision for supplying the equivalent of 10,000 or 12,000 8-candle lamps would be sufficient for some time; but during last year their business had increased by more than 7000 lamps—from 10,089 to 17,834. During the present year they had put in 1111 additional lamps; and there was every indication of the demand increasing. They had applications in hand for another 500 odd lights; and therefore they must make provision for the future. Of the lamps wired last year, more than half the total increase (4540) was connected in the second half, and 1500 in September. The number of units sold was 209,931, and the revenue was £4156, giving an average cost to the consumer of about 4¾d. per unit. This was their first year of working, and they proposed to pay a 4 per cent. dividend. In connection with the item of £2709 for installation work for consumers, on which a profit of only £20 had been brought into the year's accounts, some shareholders might think this a small profit on such an outlay; but the Company were anxious to get as much business as they could, and a great many people said they would like to have the electric light but could not face the initial cost of the installation. The Company had, therefore, put in installations at practically cost price. By this means they had gained many consumers, on the supply of current to whom they made a profit. The report was adopted.

## EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Meeting was held at the Company's Offices, St. Helen's Place, E.C., on the 5th inst.—Colonel A. R. M. Lockwood, M.P., presiding.

The Secretary (Mr. I. A. Crookenden) having read the notice convening the meeting, the report and accounts were taken as read.

The Chairman stated that it was a good many years since they had had so small a sum as £359 to carry forward after paying the dividend; but he might remind the proprietors that, for the Midsummer half year of 1896, his colleague, Mr. Banbury, the late Chairman, had to meet them with a still smaller sum—namely, £261—after paying the same rate of dividend. His own case, he therefore ventured to hope, was better than his friend's, as the accounts for the past half year had had to bear the burden of £30,615, entirely owing to the drought. This large sum was expended in the purchase of water from other Companies through the intercommunication mains which were now permanently available; and it was with considerable satisfaction that the Directors emphasized the fact that, during the whole of the past dry period, with an abnormally light rainfall, a continuous and unlimited supply of pure water had been furnished throughout the whole of the Company's district. This large extra expenditure was the sole reason why the Company's funds were drawn down to so low a figure of reserve. In connection with this subject, he might mention that, although such large quantities of water were purchased for the Company, they never drew down the reservoirs below 600 million gallons; and the pressure throughout the district was higher

last year than at any time in the Company's history. The other side of the accounts presented a bright and hopeful prospect. The percentage of increase of water-rates for the past year had been greater than had ever happened before in their history; and it would be manifest that, given a fairly normal rainfall, the vitality of the Company, by the rapidly increasing population, justified the expectancy of better times to come. The number of supplies at Christmas last was 204,671. The water-rate per house for the year ended at that date was £1 3s. 7¾d., as compared with £1 3s. 4½d. a year previously. This improvement of 3¼d. per house on the total number of the Company's supplies represented an increase in the water-rents of £2771. Apart from the uncertainty of the elements, the vast machinery necessary to carry on so extensive a business as the Company's was in the most satisfactory working order. When he said "machinery," he alluded to the human machinery—inspection, collection, and the enormous correspondence which naturally arose from a *clientèle* of over 200,000 customers. There was no doubt that the consumers began to realize that the water supplied by the East London Company was not only good and plentiful, but also cheap; and when he told the proprietors that the price at which the water was delivered at the consumers' doors for domestic purposes was a fraction over 4d. per 1000 gallons, the customers might come to the conclusion that East London water was about the cheapest commodity with which they had to deal in their daily life. From whatever cause the fact arose, the relationship between the Company and their enormous body of consumers was most pleasant and satisfactory; and the Directors were gratified in recognizing this happy result of the policy of conciliation and fair treatment which they had always pursued. He would not closely analyze the figures before the proprietors, but he might assure them that the business of the Company was in a most sound and satisfactory condition; and, as there had already been an excess of rainfall of upwards of 3 inches over that of last year, the Directors felt justified in hoping that the Company would be able to supply the whole of their customers in the current year from their own resources. The works were maintained in an efficient condition. The Board were satisfied with the progress that had been made with the new reservoirs; while the new works at other points of the Company's stations were being most satisfactorily prosecuted. The principal engineering works in hand during the half year ended Dec. 31 were the Banbury and Lockwood reservoirs, which were calculated to hold 1200 million gallons of water. The Directors kept urging Messrs. Pearson and Sons to use their utmost energy to complete these works as soon as possible. Fair progress had already been made with them; but during the present crisis of the war, the Contractors had had considerable difficulty in obtaining a large supply of labour. The report of the Royal Commission had been published, and was, as the Directors had stated, most satisfactory. One would almost suppose that the authorities would become tired of hammering at the water interest as they incessantly did, and they no doubt would if the costs came out of their own pockets; but as they were spread over the three-quarters of a million of ratepayers of the Metropolis, the expenses were not felt individually as they were by the Companies, where they took a more concrete form. For instance, this Company's charges for the year amounted to nearly £6000, and without any practical good results; for whenever the Companies had appeared before an impartial tribunal, they had invariably come off conquerors in the fight. As he told the proprietors at the last meeting, the Directors decided to re-introduce the Company's Bill which was so unfortunately rejected by a Committee of the House of Lords. This had been done; and the Bill was read a second time in the House of Commons on the 13th ult. The Directors would get it before the Committee of the House immediately after Easter; and they would use every effort to get it through both Houses of Parliament with the least possible delay. Of course, in great works of this kind, much had to be done in a preparatory way after the Bill became an Act. The Bills introduced by the London County Council were rejected by a majority of 83 on the 29th ult.; and with respect to the joint Bill which was introduced by the Companies, as alluded to in the Directors' report, this was withdrawn at the suggestion of the Speaker as being informal. Another measure which the Directors had thought it right to oppose in the interests of the stockholders, was the Bill promoted by the Lea Conservancy Board—practically to reconstitute the Board. The decision of the Committee was given on the 30th ult., approving the preamble, subject to any slight modifications that might arise on consideration of the clauses in order to make the preamble consistent with the clauses that should be finally adopted. He then explained the Committee's decision as to the manner in which the Lea Conservancy Board should be constituted; and remarked that the London County Council, with their habitual modesty, claimed the right to eight members, and hinted that they would take seven, whereas the Committee only allowed them two out of the total Board of fifteen. The Committee also decided that the annual payments asked for by the promoters—namely, £8000 for general purposes and £2000 for sanitary purposes—should be granted. This was more than double the existing contributions by the Water Companies. This decision the Directors looked upon as a violation of the parliamentary compact made in 1855; and they determined to take no further proceedings before the House of Commons Committee. Therefore, on the previous day, they withdrew from the room, intending to oppose the Bill before the Committee of the House of Lords. The Board had lost two of their colleagues—Mr. Nix by death, unfortunately, and their old friend Mr. Gadesden by impaired health. Both these gentlemen devoted very great zeal and intelligence to the best interests of the Company. Mr. George C. T. Bartley, M.P., had accepted one of the seats thus vacant, and he offered himself for re-election that day. The Directors thought that Mr. Bartley's great financial experience would be of considerable assistance to the Company. He concluded by moving the adoption of the report and accounts, and the declaration of a dividend at the rate of 7 per cent. per annum, less income-tax, on the ordinary stock for the half year ended Christmas last, payable on the 12th inst.

Mr. George Banbury seconded the resolution, which was carried unanimously.

Resolutions were afterwards passed re-electing the retiring Directors, Mr. Bartley (in the room of Mr. Gadesden) and Mr. Banbury, and the retiring Auditor, Mr. Daniel Hill.

The proceedings then terminated.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 919.

| Issue. | Share | When ex-Dividend. | Dividend or Division & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p. c. | GAS COMPANIES. | | | £ s. d. |
| 590,000 | 10 | Oct. 13 | 10½ | Alliance & Dublin 10 p. c. | 20¼—21¼ | .. | 4 17 8 |
| 100,000 | 10 | ,, | 7½ | Do. 7 p. c. | 14—15 | .. | 5 0 0 |
| 800,000 | 100 | Jan. 2 | 5 | Australian 5 p. c. Deb. | 100—102 | .. | 4 18 0 |
| 200,000 | 5 | Nov. 15 | 6 | Bombay, Ltd. | 6¼—6¾ | .. | 4 8 11 |
| 40,000 | 5 | ,, | 6 | Do. New, £4 paid | 4½—4¾ | .. | 5 1 1 |
| 380,000 | Stk. | Feb. 23 | 12 | Brentford Consolidated | 260—270 | —4½ | 4 8 11 |
| 270,000 | ,, | ,, | 9 | Do. New | 200—205 | —3 | 4 7 10 |
| 50,000 | ,, | ,, | 5 | Do. 5 p. c. Pref. | 140—145 | .. | 3 9 0 |
| 159,375 | ,, | Dec. 14 | 4 | Do. 4 p. c. Deb. | 118—123 | .. | 3 5 1 |
| 220,000 | Stk. | Mar. 14 | 11½ | Brighton & Hove Orig. | 257—242 | —5 | 4 15 0 |
| 226,320 | ,, | ,, | 8½ | Do. A. Ord. Stk. | 180—185 | .. | 4 11 11 |
| 999,500 | Stk. | Feb. 23 | 5 | Bristol, 5 p. c. max. | 125—130 | .. | 3 16 11 |
| 420,000 | 20 | Mar. 29 | 10 | British | 41½—42½* | .. | 4 13 0 |
| 50,000 | 10 | Feb. 23 | 12 | Bromley, Ord. 10 p. c. | 24—26 | .. | 4 12 4 |
| 79,000 | 10 | ,, | 9 | Do. 7 p. c. | 19—21 | .. | 4 5 8 |
| 500,000 | 10 | Oct. 13 | 6 | Buenos Ayres (New) Ltd. | 9½—10½ | .. | 5 17 1 |
| 220,000 | Stk. | Dec. 29 | 4 | Do. 4 p. c. Deb. | 99—101 | .. | 3 19 3 |
| 150,000 | 20 | Mar. 14 | 8½ | Cagliari, Ltd. | 25—27 | .. | 6 2 3 |
| 100,000 | 10 | Sept. 29 | 8 | Cape Town & Dis., Ltd. | 15½—16½ | .. | 4 17 0 |
| 50,000 | 50 | Nov. 2 | 6 | Do. 6 p.c. 1st Mort. | 56—58 | .. | 5 3 5 |
| 550,000 | Stk. | Oct. 13 | 13½ | Commercial Old Stock | 302—307 | —3 | 4 7 11 |
| 200,750 | ,, | ,, | 10½ | Do. New do. | 235—240 | —5 | 4 7 6 |
| 200,750 | ,, | Dec. 14 | 4½ | Do. 4½ p. c. Deb. | 142—145 | .. | 3 2 1 |
| 800,000 | Stk. | Dec. 14 | 9 | Continental Union, Ltd. | 155—165 | —5 | 5 9 1 |
| 200,000 | ,, | ,, | 7 | Do. 7 p. c. Pref. | 178—183 | .. | 3 16 6 |
| 51,600 | Stk. | Feb. 23 | 14 | Croydon A 10 p. c. | 335—340 | .. | 4 2 4 |
| 173,400 | ,, | ,, | 11 | Do. B 7 p. c. | 265—270 | .. | 4 1 5 |
| 555,000 | Stk. | Feb. 23 | 5½ | Crystal Palace Ord. 5 p. c. | 122—127 | .. | 4 2 8 |
| 60,000 | ,, | ,, | 5 | Do. 5 p. c. Pref. | 132—137 | .. | 3 13 0 |
| 486,090 | 10 | Jan. 26 | 11 | European, Ltd. | 19½—20½ | —½ | 5 7 4 |
| 354,060 | 10 | ,, | 11 | Do. £7 10s. paid | 15—16 | .. | 5 3 2 |
| 14,393,075 | Stk. | Feb. 9 | 4 5/10 | Gas-light and Coke | 4 p. c. Ord. | 102—104 | —2 | 4 14 2 |
| 2,500,000 | ,, | ,, | 3½ | | 3½ p. c. max. | 97—99 | .. | 3 10 8 |
| 3,799,735 | ,, | ,, | 4 | | 4 p. c. Con. Pref. | 119—122 | .. | 3 5 7 |
| 3,993,975 | ,, | Dec. 14 | 3 | | 3 p. c. Con. Deb. | 98—100 | —1 | 3 0 0 |
| 70,000 | 10 | Nov. 15 | 8 | Hongkong & China, Ltd. | | 13½—14½ | .. | 5 10 4 |
| 3,800,000 | Stk. | Nov. 15 | 10 | Imperial Continental | | 211—214 | .. | 4 13 6 |
| 473,600 | Stk. | Feb. 9 | 3½ | Do. 3½ p. c. Deb. Red. | | 100—103 | .. | 3 8 0 |
| 75,000 | 5 | Dec. 14 | 6 | Malta & Medn., Ltd. | | 4½—5½ | .. | 5 9 1 |
| 560,000 | 100 | Apl. 2 | 5 | Met. of | 5 p. c. Deb. | 107—111* | .. | 4 10 1 |
| 250,000 | 100 | ,, | 4½ | Melbourne | 4½ p. c. Deb. | 105—107* | .. | 4 4 1 |
| 641,920 | 20 | Nov. 15 | 3 | Monte Video, Ltd. | | 11—12 | .. | 5 0 0 |
| 667,946 | Stk. | Feb. 23 | 9½ | Newc'tle & Gatesh'd Con. | | 215—220 | .. | 4 4 1 |
| 299,855 | Stk. | Dec. 29 | 8½ | Do. 8½ p. c. Deb. | | 104—107 | .. | 3 5 5 |
| 150,000 | 5 | Nov. 30 | 8 | Oriental, Ltd. | | 7—7½ | .. | 5 6 8 |
| 133,000 | 5 | ,, | 8 | Do. New, £4 10s. pd. | | 6¼—6¾ | .. | 5 6 8 |
| 15,000 | 5 | ,, | 8 | Do. do. 1879, £1 pd. | | 1¼—1½ | .. | 4 11 5 |

* Ex div.

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p. c. | GAS COMPANIES. | | | £ s. d. |
| 60,000 | 5 | Feb. 23 | 7 | Ottoman, Ltd. | 4¾—5¼ | .. | 6 13 4 |
| 500,000 | 100 | Dec. 1 | 6 | People's Gas of Chicago | 2nd Mtg. Bonds | 102—106 | .. | 5 13 2 |
| 851,070 | 10 | Oct. 13 | 7 | River Plate Ord. | | 11¼—11⅝ | .. | 5 19 2 |
| 250,000 | Stk. | Dec. 29 | 4 | Do. 4 p. c. Deb. | | 100—102 | .. | 3 18 5 |
| 250,000 | 10 | Sept. 15 | 8† | San Paulo, Ltd. | | 11½—12½ | .. | 6 8 0 |
| 135,000 | Stk. | Sept. 15 | 10 | Sheffield A. | | 249—251 | .. | 3 19 8 |
| 209,053 | ,, | ,, | 10 | Do. B. | | 249—251 | .. | 3 19 8 |
| 447,427 | ,, | ,, | 10 | Do. C. | | 249—251 | .. | 3 19 8 |
| 5,600,000 | Stk. | Feb. 23 | 5½ | South Metrop., 4 p.c. Ord. | | 135—137 | —½ | 3 17 10 |
| 1,520,000 | ,, | Jan. 12 | 3 | Do. 3 p. c. Deb. | | 100—102 | .. | 2 18 10 |
| 380,940 | Stk. | Nov. 30 | 5 | Southampton Ord. | | 117—122 | .. | 4 2 0 |
| 70,825 | ,, | Dec. 29 | 4 | Do. 4 p.c. Deb. | | 120—125 | .. | 3 4 0 |
| 120,000 | Stk. | Mar. 14 | 6 | Tottenham and | A. 5 p.c. B. 3½ p.c. | 139—141 | .. | 4 5 1 |
| 250,520 | ,, | ,, | 4½ | | | 100—102 | .. | 4 8 3 |
| 55,100 | ,, | Dec. 14 | 4 | Edmonton | 4 p. c. Deb. | 113—117 | .. | 3 8 5 |
| 182,380 | 10 | Jan. 12 | 5 | Tuscan, Ltd. | | 8—9 | .. | 5 11 1 |
| 149,900 | 10 | Jan. 2 | 5 | Do. 5 p. c. Deb. Red. | | 101—104 | .. | 4 18 2 |
| | | | | WATER COMPANIES. | | | |
| 780,399 | Stk. | Dec. 29 | 11 | Chelsea, Ord. | | 307—312 | .. | 3 10 6 |
| 150,000 | ,, | ,, | 5 | Do. 5 p. c. Pref. | | 157—162 | .. | 3 1 9 |
| 160,000 | ,, | ,, | 4½ | Do. 4½ p. c. Pref. '75 | | 145—150 | .. | 3 0 0 |
| 175,785 | ,, | Mar. 29 | 4½ | Do. 4½ p. c. Deb. | | 145—150* | .. | 3 0 0 |
| 1,720,560 | Stk. | Oct. 13 | 7 | East London, Ord. | | 200—205 | —2 | 3 8 4 |
| 654,740 | ,, | Dec. 29 | 4½ | Do. 4½ p. c. Deb. | | 145—150 | .. | 3 0 0 |
| 390,000 | ,, | ,, | 3 | Do. 3 p. c. Deb. | | 99—101 | .. | 2 19 5 |
| 700,000 | 50 | Dec. 14 | 7½ | Grand Junction | 10 p. c. max. | 107—109 | —1 | 3 8 10 |
| 810,000 | Stk. | Mar. 29 | 4 | | 4 p. c. Deb. | 130—135* | .. | 2 19 3 |
| 708,000 | Stk. | Feb. 23 | 14 | Kent | | 307—312 | .. | 4 9 9 |
| 160,000 | ,, | ,, | 7 | Do. New, 7 p. c. max. | | 200—210 | .. | 3 6 8 |
| 1,043,800 | 100 | Dec. 29 | 10½ | Lambeth, 10 p. c. max. | | 295—300 | .. | 3 10 0 |
| 406,200 | 100 | ,, | 8 | Do. 7½ p. c. max. | | 215—220 | .. | 3 12 9 |
| 350,000 | Stk. | Mar. 29 | 4 | Do. 4 p. c. Deb. | | 130—133* | .. | 3 0 2 |
| 500,000 | 100 | Feb. 23 | 13½ | New River, New Shares | | 418—423 | —2 | 3 3 9 |
| 1,000,000 | Stk. | Jan. 26 | 4 | Do. 4 p. c. Deb. | | 132—137 | .. | 2 18 5 |
| 902,300 | Stk. | Dec. 14 | 7½ | South-wark and | Ord. 7½ p. c. max. 5 p. c. Pref. | 200—205 | .. | 3 13 2 |
| 126,500 | 100 | ,, | 7½ | | | 190—195 | .. | 3 16 11 |
| 489,200 | Stk. | ,, | 5 | | | 160—165 | .. | 3 0 7 |
| 1,019,585 | ,, | Oct. 13 | 4 | Vauxhall | 4 p. c. A Deb. | 131—136 | .. | 2 18 10 |
| 1,155,066 | Stk. | Dec. 14 | 10 | West Middlesex | | 288—293 | .. | 3 8 3 |
| 200,000 | ,, | ,, | 4½ | Do. 4½ p. c. Deb. | | 147—152 | .. | 2 19 3 |
| 200,000 | ,, | Mar. 14 | 3 | Do. 3 p. c. Deb. | | 99—101 | .. | 2 19 5 |

*Ex div.

† Next dividend will be at this rate.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

Astronomers begin their year on the 20th of March. Gas managers in Scotland, I suppose, have come to look upon the first Wednesday in April as the determining point from which to date events. It is then that they first emerge from their winter's seclusion, and meet in conference and enjoyment. I had the pleasure of being present at the Informal Meeting in Glasgow this week. My opinion of it is that it was the best of all these meetings I have known. It was the most numerously attended, for one thing, the reason for which I attribute to two causes—first, to the popularity of the President (Mr. J. W. Carmichael, of Barrhead); and, secondly, to the bond which makes all gas managers "wondrous kind" at the present moment, the high price of coal. To speak to the first, men came from far and near because Mr. Carmichael was in the chair—from Montrose because he started in life at St. Andrews with Mr. Hall, and from Kilmarnock out of respect arising from the feeling of neighbourhood. Mr. Carmichael has not been a prominent man in the public sense of the word; and it will be matter of regret that, now he has come to the front, he should decline to go forward to higher honours. He ought to be the next President of the North British Association of Gas Managers; but I understand that he declines the office. This is to be regretted, because the address he gave to the Informal Meeting was of so high a character, so full of matter, so well put, and altogether so apposite, that, if he had allowed himself to become the President of the Formal Meeting of Gas Managers, he would, at the gathering in 1901, judging by his appearance at the Informal Meeting, have added lustre to the office. His address, given in another column, was in reality a weighty communication. It had the faculty of bringing out discussion, which is the first requirement of a Presidential Address at an informal meeting; but it had more within it—it contained the essence of much that lies underneath the surface of current thought in gas managers' circles. The price of coal, the illuminating power of gas, and the questions flowing from these, were all brought forward in appropriate sequence, and were dealt with in a masterly way. The address testifies to Mr. Carmichael being an enlightened, and a highly practical, Gas Manager. Were further testimony to his ability asked, it is to be found in the fact of Major Pollock, a Queen's Prizeman, and one of his Directors, attending the dinner which followed the meeting, and giving expression to the high esteem in which the President is held by his Board.

Having laid the foundation for a good discussion, the discussion followed. As it proceeded, I could not help noting that I have never attended a meeting of gas managers in which less was said in congratulation of the author; but the reason for that, I presume, was that there was so much in the address that there was no time for platitudes—the speakers wanted to get at the merits at once, and the usual courtesies were held to be "understood."

The chief point discussed was the question of the lowering of the illuminating power of the gas. Hitherto, Scotland has held a unique position in gas supply, because of the cannel coal which could be had at the door of the gas-works, by means of which gas managers were able, at small cost, to supply a high-quality gas at a low price. But the times are changing. The cannel is believed to be approaching exhaustion; and other methods of getting light out of gas are being developed. The question of high-quality gas is being bombarded on two sides. On the one, the gas manager is being plied by the man who has oil to sell, who says that he can give the elements which will keep up the illuminating power; and, on the other, he is confronted with the fact that, owing to the development of the incandescent mantle, he can dispense with gas of high illuminating power. There is a big cross in the situation, or a big "if." If the cannel fields are giving out? If they are, then the supply of gas in Scotland will become what it is in other parts of the world. If they are not—but "there's the rub"—then those who prefer, like Mr. M'Gilchrist, to supply light and not gas, will find it to be to their benefit to continue a high illuminating power, and not join in a reduction. Judging from the tone of the meeting, cannel is giving out; and therefore the distinguishing feature of Scotch gas is likely to be lost. Gas in Scotland must be what it is elsewhere. As in other parts of the world, the question will be how, with a given coal—a coal of no pretension—to supply a gas which will suit the consumer. And it must be borne in mind that the consumer is not only the man who wants to see, but the man who wants to use gas for working as well. It must be confessed that the outlook for what may be called Scotch gas is not very promising. The bombardment on the side of those who want cheaper gas for all purposes is undoubtedly heavier than that on the side of those who want a richer gas for illuminating purposes only.

Thus Scotch gas comes down to the level of the world's supply; and Scotland loses her distinctive position. This is the chief lesson which is borne home by the meeting. Are Scotch gas managers likely to accept the lesson? That cannot be foreshadowed. But it is a curious circumstance—and one not to be left out of account in this connection—that in the matter of illuminating power there has existed in Scotland an element which has never before been reckoned with, or even known to be in the land. The number of gas managers in Scotland who have had experience in England of low-grade gas is, to say the least of it, amazing. The general belief has been that Scotch managers went South, and secured situations which they could the better fill because of their knowledge of how to supply the higher quality of gas; now we have it, on the testimony of ever so many speakers at the Informal Meeting, that they are Gas Managers in Scotland only after having served a term in England. Instead of the rush having been South, as it was believed to be, it has actually been North. The way has thus been paved, unseen, not to say insidiously, for the sudden development of the low-grade gas phalanx. That they have lain low till now has, of course, been due to circumstances; but the time having come—of dear coal and incandescent lighting—they have raised their heads with surprising swiftness. And it may take a good deal of negotiation to get them to turn aside from the movement now begun. It may be taken for granted that low-grade gas is bound to be promoted in Scotland in the very near future.

The only other subject before the meeting which I will comment upon

LATEST DEVELOPMENT
IN
GAS-COOKERS

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is that of the standardizing of meter-unions. On this question Mr. O'Connor's remarks were to the point. He first of all cited the remark of the late Mr. D. Bruce Peebles, to the effect that if he got an order of a certain description he would not refuse it; and then he said something which I could not quite follow, but which was to the effect that in a dry meter the union was one of the first things which was fixed, and that to alter it would mean taking the meter almost to pieces. He therefore advised, so I understood him, that it would be better to have the standard unions applied to new meters, instead of altering existing ones. This puts a new complexion upon the movement for standardizing meter-unions. The life of a meter is anything up to fifty years. If, therefore, a manager—to take a small works—resolved to, or was concussed into, adopting standard unions, he would still require, for fifty years, to give orders for differential sizes, and only about that time be in a position to work out his differentials and work in his standards. The question is whether the game is worth the candle. It is two or three years since the subject was raised. Standard unions have been made, and are now available. They have been adopted by the North British Association of Gas Managers. Have they been adopted by any member of the North British Association? Mr. Lighbody, of Renfrew, said that he had induced about six meter makers in Scotland to supply him with uniform couplings, at no extra cost; but he did not state that they were the standard couplings. Neither did any other Manager say that he had ordered the standard couplings. On the other hand, though these standard couplings have been available for about three years, there is not an instance of any of the meter makers having advertised that they are prepared to supply meters according to them. These remarks are not intended to throw cold water on the question, but to point out the difficulties in the way. As an academic subject, there can be only the one opinion—that the change should be made; but as a concrete subject, it turns out that while the large gas-works might make the change in a year or two with little loss, the small undertakings, for whom the reform is chiefly intended, would have to get along for about fifty years before they could reap benefit by the alteration. And with them the question is, seeing that they get willing service from meter makers, which suits them, whether they would be any better if they were to adopt a uniform coupling. Generally speaking, a uniform coupling would be an advantage; but considering that a multiplicity of couplings are already in existence, it might arise, in a small works, that a uniformity of couplings would cause trouble and expense, because uniformity of stocks would not suit variety of circumstances. It would appear as if the subject required more looking into. The question is for every gas manager to consider how much it would cost him to transfer to the uniform system, and how much he would save afterwards. If the subject, having been put aside by the Associations of Gas Managers in England, is to be again raised in Scotland, this is the point to be put before gas managers. Theoretically, no one can dispute the position of the advocates of uniformity. In practice it may be different; and that is the first matter to be ascertained, because an abstract resolution of the North British Association would be of no consequence if travellers for meter makers continued to go their rounds and get orders for meters on the old lines.

The Town Council of Hamilton, on Thursday, unanimously agreed to advance the salary of their Gas Manager (Mr. W. Ewing) by £75 per annum. In making the proposal, Bailie M'Hale, the Convener of the Gas Committee, said that, in regard to ability, few gas managers in Scotland ranked higher than did Mr. Ewing. The Hamilton Gas-Works were the most economically managed in Scotland. Bailie Pollock, who is not on the Gas Committee, seconded. He remarked that during the last few years he had said many hard things of the Gas Committee and the Gas Manager; but, notwithstanding this, no one in the Town Council appreciated the services of Mr. Ewing more than he did. It would thus appear that all trace of opposition to Mr. Ewing, which has hitherto lingered in the bosoms of a few councillors in Hamilton, has disappeared, and that he now has the undivided support of the Council. Mr. Ewing has been long enough in Hamilton to show his worth; and anyone who should endeavour to hold out against him now would, I suspect, find it hard to give a reason for his action. No fair-minded person could find any such reason. As a matter of fact, Mr. Ewing has closed another working year with results which will surprise everyone. The Town Council last year would not reduce the price of gas, as he recommended; and the result is that they have made too much money. One effect of this is, as stated by Mr. Ewing at Glasgow, that they will be able to go on without raising the price of gas—a circumstance which will make Hamilton highly favoured indeed among the towns in the United Kingdom. There is another effect which I may mention. Too large a profit will lead to a raising of the valuation of the works, and thereby to the imposition of increased taxation. To this intent, the councillors of Hamilton should now realize that it will in future be to their profit to follow the advice given them by their Manager.

The Corporation of Glasgow, on Thursday, agreed, by 33 votes to 15, to a resolution requiring contractors to pay fair wages. The opposition to the resolution was put forward by the Gas Committee, on whose behalf it was contended that it would be impossible to carry out such a resolution. For instance, the Committee buy large quantities of coal; and they have no means of knowing whether those from whom they purchase do or do not pay fair wages. That is so; and therefore the resolution will be a dead letter generally. It will, however, be available for resurrection whenever it suits the labour leaders in the Council to challenge any particular contract.

On Monday, the Town Council of Aberdeen agreed to a motion proposing a remit to the Water Committee to inquire and report as to the practicability and cost of obtaining an additional supply from the River Dee or its tributaries, in order that a comparison may be made with the cost of the Avon scheme. It is admitted that the Avon scheme, if it be proceeded with, will be bitterly opposed by the landed interest; and its cost will be very great. If a tributary of the Dee could be impounded, it would—were the quality satisfactory—be a cheaper and more easily worked scheme. The Corporation cannot afford to delay much longer arriving at a conclusion upon the subject, because the city is expanding rapidly, and the present water-works have nearly reached the limit of their capacity.


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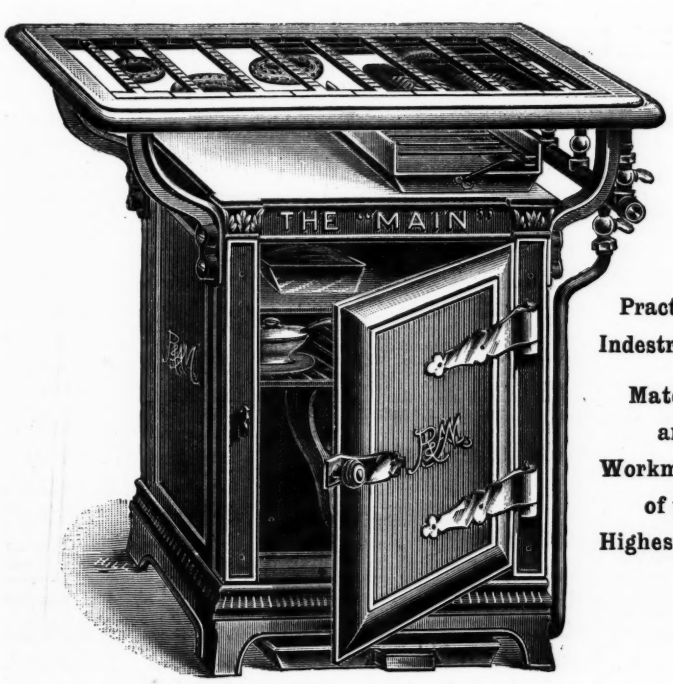
## The "Main" Gas-Cookers.

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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 7.

**Sulphate of Ammonia.**—In the early part of the week, prices, under the influence of second-hand selling, became very irregular and declined; but, makers for the most part refusing to follow, a steadier tone was seen towards the close—the quotations being £11 13s. 9d. to £11 15s. per ton f.o.b. at the ports. Home demand in England is making itself felt; but in Scotland it has so far, owing to the lateness of the season, been altogether disappointing. Exports continue on a satisfactory scale; but new business has been rather scarce, although there has been good inquiry for the near months. London is quoted at £11 15s. per ton, Beckton terms, for May-June delivery; but Scotch makers are mostly off the market in the forward position. There was "bear" offering early in the week at a discount on prompt prices; but later the quotations were advanced to spot level.

**Nitrate of Soda** is steady at 8s. 9d. per cwt. for ordinary, and 8s. 10½d. for fine, quality.

LONDON, *April* 7.

**Tar Products.**—There is no improvement in this market. Pitch, however, maintains its increased value; but other products are more or less easier. Benzols are extremely dull; and very low prices are being taken for early delivery. There is a steadier outlet for naphthas at the lower figures quoted. Creosote and tar oils are not so good. Carbolic acid continues to find buyers at prices quoted; and makers are remarkably free from stocks of it. Naphthalene is moving freely; and it is said that business in it is likely to be better. There is no change in anthracene, which still continues at a nominal quotation.

The average values obtaining during the week are: Tar, 17s. 6d. to 27s. 6d. Pitch, east coast, 37s.; west coast, 34s. Benzol, 90's, 6d.; special qualities for gas, 8d.; 50's, 9d. Toluol, 90's, 1s. 1d.; pure 1s. 9d. Solvent naphtha, 1s. 1d. Crude, 30 per cent. naphtha, 3¾d. Heavy naphtha, 10d. Creosote, 2½d. to 3¼d. Heavy oils, 3¼d. Carbolic acid, 50's, 2s. 1½d.; 60's, 2s. 6d. Naphthalene, 45s. to 70s. Anthracene, "A" quality, 4d.; "B," 2½d.

**Sulphate of Ammonia.**—The determined effort to depress this market has been more or less successful, but not to the extent which "bear" operators had hoped. The absence of stocks in makers' hands, and the undoubted good inquiry for foreign account, as well as for home consumption, has prevented a further drop in prices than is recorded. £11 15s., less 3½ per cent. is the value in all positions.

**Divining for Water.**—The art of water finding has again been employed in Scotland. The estate of Colonel Gammell, in Perthshire, suffered from an insufficient water supply; and the services of Mr. Leicester Gataker, the "diviner," were requisitioned. Acting on his advice, a very strong spring has been tapped, which will doubtless be of immense value to the property.

## COAL TRADE REPORTS.

**From Our Own Correspondents.**

**Lancashire Coal Trade.**—Here and there reports come to hand from collieries that the position is perhaps not quite so satisfactory as it has been of late; and in isolated cases fuel is accumulating in small quantities. Generally, however, throughout Lancashire pits have still no difficulty in disposing of all they are raising, which, for the most part, is a good deal below the average, owing to the restriction of the get by the miners; and prices are being fully maintained at late rates. The backward state of the season is keeping up, perhaps, more than an average demand for house-fire purposes, and this is preventing any accumulation of stocks in the better sorts of round coal. The lower qualities are in as brisk request as ever, for iron-making, steam, and general manufacturing purposes; and the same applies to engine fuel—the principal Lancashire collieries being short to meet requirements. The leading coalowners of Manchester, Salford, and the surrounding districts, including Tyldesley and Leigh, who have all along been very pressed for supplies of all descriptions of steam fuel, yesterday advanced their list prices 10d. per ton on engine fuel and steam nuts, and 5d. per ton on burgie. There is no further advance so far as other descriptions of fuel are concerned; and at present no intimation has been forthcoming that the upward move in the Manchester and surrounding districts is being followed in the other important Lancashire mining centres. But the action that has been taken by the leading Manchester coalowners will no doubt have a considerable effect upon prices generally. Quoted list rates may now be given as 14s. 6d. to 15s. 6d. per ton at the pit for best Wigan Arley, 13s. to 14s. for Pemberton four-feet and seconds Arley, 12s. 6d. for steam and forge coal, and from 9s. 6d. and 10s. for medium sorts to 10s. 6d. and 11s. for best slack. Following upon the decision of the Lancashire collieries with regard to the advance in gas coal prices referred to last week, the locomotive fuel contracts have been under consideration; and in some quarters as much as 6s. per ton over last year's rates is being strongly advocated. But it is doubtful whether the advance will exceed that which has been resolved upon with regard to gas coal. It seems probable, however, that it will not be less than 5s. per ton over the 1899 prices, which would bring locomotive fuel up to 13s. per ton at the pit. Shipping is not so brisk as it has been; and although Lancashire collieries are holding to their minimum basis of 16s. for steam coals, delivered at the ports on the Mersey, this figure is not being readily obtained. Coke manufacturers have advanced their list rates 2s. per ton on both foundry and furnace qualities; quotations now averaging 29s. to 32s. according to quality for foundry, and 24s. to 25s. for furnace cokes—these prices being at the ovens.

**Northern Coal Trade.**—The coal trade has shown a little improvement in the last few days, as is usual shortly before holidays, when consumers have to enlarge the stocks they hold. Best Northumbrian steam coals are quoted at about 17s. 6d. per ton f.o.b., which is perhaps 6d. above the lowest rate last month, but is still considerably below the prices that prevailed earlier this year. Steam smalls are from 11s. to 11s. 6d. per ton. In the gas coal trade, the price that is quoted for best


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|---|---|---|---|
| BLACKBURN | 1,250,000 | BUFFALO, N.Y. | 2,000,000 |
| WINDSOR ST. WORKS, BIRMINGHAM | 2,000,000 | WINNIPEG, MAN. | 500,000 |
| SALTLEY WORKS, BIRMINGHAM | 2,000,000 | COLCHESTER (Second Contract) | 300,000 |
| COLCHESTER | 300,000 | YORK | 750,000 |
| BIRKENHEAD | 2,250,000 | ROCHESTER | 500,000 |
| SWINDON (New Swindon Gas Co.) | 120,000 | KINGSTON, ONT., | 300,000 |
| SALTLEY, BIRMINGHAM (Second Contract) | 2,000,000 | CRYSTAL PALACE DISTRICT | 2,000,000 |
| WINDSOR ST., BIRMINGHAM (Second Cont.) | 2,000,000 | DULUTH, MINN. | 300,000 |
| HALIFAX | 1,000,000 | CATERHAM | 150,000 |
| TORONTO | 250,000 | LEICESTER | 2,000,000 |
| OTTAWA | 250,000 | ENSCHEDE (HOLLAND) | 150,000 |
| LINDSAY (Remodelled) | 125,000 | BUENOS AYRES (RIVER PLATE CO.) | 700,000 |
| MONTREAL | 500,000 | BURNLEY | 1,500,000 |
| TORONTO (Second Contract; Remodelled) | 2,000,000 | KINGSTON-ON-THAMES | 1,750,000 |
| BELLEVILLE | 250,000 | ACCRINGTON | 500,000 |
| OTTAWA (Second Contract) | 250,000 | TONBRIDGE | 300,000 |
| BRANTFORD (Remodelled) | 200,000 | STRETFORD | 500,000 |
| ST. CATHERINES (Remodelled) | 250,000 | OLDBURY | 300,000 |
| KINGSTON, PA. | 125,000 | TODMORDEN | 500,000 |
| PETERBOROUGH, ONT. | 250,000 | SALTLEY, BIRMINGHAM (Third Contract) | 2,000,000 |
| WILKESBARRE, PA. | 750,000 | YORK (Second Contract) | 750,000 |
| ST. CATHERINES (Second Contract) | 250,000 | | |

Durham gas coals for occasional cargoes is from 16s. 6d. to 17s. 6d. per ton f.o.b. Deliveries are heavy, including some on account of old orders that had got behind. As to the contracts for the large gas companies of the South, it is believed that one portion has been allotted; but no details are yet procurable. In another case, deliveries of "shorts" will extend the supply over this month. Coke is very firm on all hands, and prices higher. Gas coke is now not quite so abundant; the output being reduced. The figure that is most frequently quoted is about 16s. per ton f.o.b.; but in a short time new contracts will probably be made, and a nearer approach to a fixed price will be obtainable.

**Scotch Coal Trade.**—There is little change to record, either in demand or prices. It is said that the miners are not working so steadily as they did during the winter, and that the output is being thereby affected, with its inevitable result upon prices. The miners are averse to accumulations of coal being made at the pit-heads, which explains their unsteady working. The prices are: Main 14s. to 14s. 3d. per ton f.o.b. Glasgow, ell 15s. to 15s. 9d., and splint 14s. 9d. to 15s. The shipments for the week amounted to 216,496 tons—an increase of 30,099 tons upon the previous week, and of 38,891 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,378,921 tons—an increase of 586,180 tons upon the same period of last year.

**Kingsbridge Water Supply.**—More than ordinary difficulty is being experienced by the Kingsbridge Urban District Council in obtaining a supply of water for the town. After much consideration and negotiation, a scheme was put forward a year ago, only to be condemned by the Local Government Board on the ground that the District Council were not obtaining sufficient control over the source of supply. As the purchase of the watershed was impracticable, the Council consulted Messrs. Taylor, Sons, and Santo Crimp, and another scheme was prepared. The Board have now intimated that it will be necessary for the Council to obtain the consent of all the riparian owners, and that until this is done they cannot recommend that a Provisional Order be granted. The Engineers pointed out to the Board the impossibility of doing as suggested, and asked for an interview. To this the Board replied that they could not see that any good would result therefrom, as it was essential to get the consent of the riparian owners before further steps were taken. In communicating this reply to the Council, the Engineers said they considered it hard that the Local Government Board should have allowed them to go so far before putting in the condition. The Council would either have to obtain a Provisional Order, which was costly, or abandon the scheme. At a meeting of the Council on Thursday, when the correspondence was read, the Chairman (Mr. Hurrell) said he considered it perfectly useless to attempt to get the consent of all the riparian owners right to the sea. The Council had done everything in their power to promote a water scheme for the town; but the Local Government Board had apparently been endeavouring to put every obstacle in their way. Consideration of the correspondence was adjourned to a future meeting of the Council.

**Gas and Electricity Profits at Southport.**—The Gas Committee of the Southport Corporation have decided to make a grant of £8000 out of the profits of the gas estate in relief of the rates of the coming year; and the Electricity Committee will make one of £1500 for a like purpose.

**St. Anne's-on-the-Sea Gas Company.**—At the recent annual meeting of this Company, the balance-sheet presented showed a total expenditure of £4087, or £662 more than in the previous year. There was a profit, after meeting all outgoings, of £2208; and the Directors recommended the declaration of dividends of 10 and 7 per cent. This was agreed to.

**Cape Town Water Supply.**—The Water Committee of the Cape Town Municipal Council have had under consideration for some time a comprehensive scheme for the better distribution of the water supply of the city. Inasmuch as the expenditure involved is very much greater than the Council could at present meet, the Committee are of opinion that only such works as are absolutely necessary should be undertaken; and in this connection they have specially considered representations with regard to the need for laying the eastern high-level main, the length of which would be approximately 13,000 feet, and is estimated to cost £7000. By means of this main, it will be possible to supply the whole of the higher levels of the city in the eastern district, which is impossible under existing circumstances; and the Committee consider it desirable that this important work should be undertaken without further delay. Owing to the increased expenditure on capital account in connection with the large reservoirs on Table Mountain, the Council propose to raise the charges for water. Hitherto the rate has been £1 10s. per annum for a supply of 100 gallons per day; and this is to be increased to £2 per annum for the like quantity. It is claimed that, even at the advanced rate, the supply will still be one of the cheapest in South Africa, while it is among the most constant and abundant.

**Plymouth Corporation Water Supply.**—Mr. E. Sandeman, the Water Engineer of the Plymouth Corporation, has presented a report on the progress of the undertaking during the year ended Dec. 31 last. The total length of new mains laid was 6 miles 1485 yards, and 810 yards of mains were renewed. In recent years, owing to greater attention to the renewal of old mains, the number of bursts of pipes has considerably decreased. In 1899 the total was 13, as compared with 26 in 1898 and 57 in 1895. The new domestic supplies connected last year numbered 768; bringing up the total to 16,175, of which 5300 have been connected in the past ten years. Of trade supplies by meter there are 332, of which 113 were added in the past twelve months. The supply for trade purposes exceeded 711 million gallons in 1899—an increase of 138 per cent. on the quantity supplied for this purpose in 1889; while the income from this source, amounting to £7581, has risen in the same period at the rate of 142 per cent. The estimated revenue for the financial year ended March 31 is £22,500; and the charges for maintenance and salaries, £5383. A diagram illustrating the quantity of water used shows that in the September quarter of last year, when the weather was very hot and dry, the consumption rose to 220 million gallons. In the June quarter, it had only been 160 million gallons; and the highest previous consumption was 170 millions, in the summer quarter of 1898.


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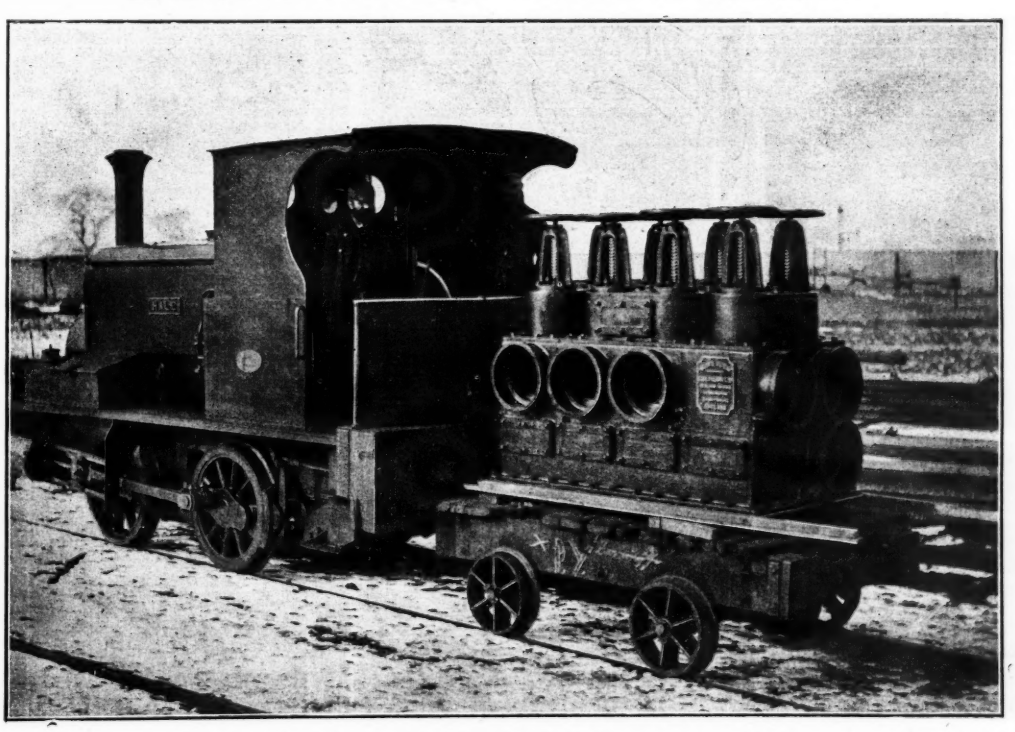

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**The Dukinfield Gas Committee and Carburetted Water Gas.**—A Sub-Committee of the Dukinfield Corporation Gas Committee have been visiting, accompanied by the Engineer and Manager (Mr. Harrison Veevers), four works in which carburetted water gas is made, with the object of inquiring into its economical advantages for furnishing additional manufacturing power as compared with the provision of extra storage. They came to the conclusion that, as an auxiliary in the carbonizing department of a gas-works, there could be no question of the value of carburetted water-gas plant; but that as a substitute for sufficient gasholder capacity, it was of very limited benefit. They thought, however, that in any future scheme for the extension of the works, the new system should have serious, if not favourable, consideration. The Gas Committee approved of the conclusion come to by their Sub-Committee; but they decided not to take any action at present for the provision of additional holder capacity. The Council have passed the minutes.

**Antwerp Water-Works Company, Limited.**—The annual meeting of this Company was held on March 30 at the Cannon Street Hotel. Mr. David Evans presided, and moved the adoption of the report, which stated that the income from all sources amounted to £43,793, as compared with £40,971; and after deducting expenses, and adding the undivided profit of £662, a sum of £28,593 remained. Against this had been charged the debenture interest and income-tax for 1899, the contribution to the reserve fund of 5 per cent. on the net profits, the interim dividend of £9000, £5000 for the sinking fund, and £464 extra remuneration for the Directors. A balance of £10,839 was then left for distribution; and out of this the Directors proposed a dividend at the rate of 7 per cent. per annum—making a total of 6½ per cent. for the year. It was also stated that a new duplicate trunk main had been nearly completed, and that more than three-quarters of it was in use; this having brought about a most satisfactory improvement in the pressure in the town. To keep pace with the continually increasing consumption, certain extensions were necessary at the pumping-station at Waelhem; and upon these, it was estimated, the outlay would be £10,000. The Chairman, having explained the differences in some of the items in the accounts compared with the preceding year, announced that the Belgian Government had relinquished their claim for income-tax on the money appropriated to the sinking fund; and the Directors were again making an appeal to the Income-Tax Commissioners here in regard to the same matter. With respect to the extensions, the Directors hoped that, when the work was completed, it would be some little time before any serious expenditure was again required. Referring to a proposal of the Board that the amount appropriated as sinking fund for the share capital, instead of being accumulated, should be annually divided among the shareholders as a return of capital, he said the Directors felt that, unless they invested the money in first-class and low-interest yielding securities, they were taking an unnecessary responsibility; while if the shareholders had the money, they would be able to make their own selection of investments. The report was adopted; and a resolution was passed consenting to the discontinuance of the sinking fund. It was explained that the amount already accumulated would be retained, and the fund continued to the extent required for the redemption of the debentures.

**West Gloucestershire Water Company.**—The report submitted at the half-yearly meeting of this Company showed that there had been a normal increase in new connections, and that extensions of works had been proceeding. It was also stated that since the last meeting £1710 of fully-paid shares had been applied for and issued at £1 premium. The total amount now issued under the 1887 Act was £60,000; and under the Act of 1899 £7800 of shares had been disposed of by tender at a premium of above 30s. per share. The accounts for this half year showed that, after paying all working expenses and interest on debenture stock, there was a net profit of £1932, which, together with £194 brought forward, made a total of £2126. The declaration of a dividend was recommended at the rate of 4 per cent. per annum on the 1884 shares, and £2 16s. on the 1887 shares. The Chairman (Mr. Enoch Horton), proposing the adoption of the report, congratulated the shareholders on the fact that the number of customers and the amount of the revenue continued to steadily increase. The estimated revenue was just under £7000 per annum; and, as a matter of fact, the amount actually received for the past half year was £3550. The report was adopted.

**Bristol Water-Works Company.**—The report and accounts of this Company, which were noticed last week, were presented at the annual meeting of the shareholders by the Chairman (Mr. Edward Bush). In the course of his address, he stated that the net revenue (£122,850) exceeded that of the previous year by £5079. The result had been better than ever before. The sum brought forward was £6800; and they would carry over a rather better balance, after paying ½ per cent. more dividend, notwithstanding that they had had to pay additional money during the year on unfinished work. When this was completed (it was chiefly in connection with the Yeo Valley reservoir), more would be available for distribution among the shareholders. Already water had been impounded in the Yeo reservoir, which was two-thirds full; the amount gathered being 1200 million gallons, or half as much again as that in the other three reservoirs. Difficulty had been experienced in getting anyone to make the engines for pumping; but they were now being constructed, and were expected to be finished in about twelve months. The consumption of water continued to increase. Although there was duplicate pumping machinery at Clifton, it had been thought advisable to have a third engine; and it was in course of erection. Steps were being taken to maintain the purity of the supply; and for this purpose, parliamentary powers were being sought to deal with sewage round the various works. Happily, the Bill was passing through both Houses unopposed. During the year, 1760 new services had been laid on; and altogether, the Company were supplying about 62,000 premises. The result of lowering the charges for baths in private houses four years ago had been an increase at the rate of 12 per cent. per annum in each of the four years. Nothing more had been heard from the Corporation relative to the acquisition of the concern. The report was adopted; and dividends at the rate of 7¾ per cent. per annum on the ordinary shares, and at the rate of £5 8s. 6d. on the 7 per cent. maximum consolidated ordinary stock were declared. Later in the proceedings, it was mentioned that this was the forty-third year of the Chairman's service. When he joined, the revenue was not £15,000; now it was £123,000.

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**Leeds Corporation Water Supply.**—At the meeting of the Leeds Corporation last Wednesday, Alderman Cooke, Chairman of the Water Committee, proposed that application be made to the Local Government Board for sanction to borrow £146,921 for water-works purposes. This amount, Mr. Cooke explained, was the balance of the £250,000 for which borrowing powers were obtained by the Act of 1893. In 1896 the Council approved of the expenditure of £103,000, and he now asked for sanction to borrow the rest. The money was required for ordinary as well as for extraordinary extensions. Ordinary extensions might be summarized as the substitution of large mains for small ones, and the extension of the water-works system to localities where new lots of property had been built. This was represented by a sum of £13,000; but the chief item was £83,500 for a 30-inch main from Swinsty to Eccup, together with the easement. Mr. Cooke added that such expenditure must from time to time recur by reason of the extraordinary growth of the city; and he did not care how often he had to come before the Council, when he could show such excellent results as the Committee had been able to produce. The proposition was agreed to.

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The Directors of the Imperial Continental Gas Association recommend a dividend of 5 per cent. for the half year ending the 31st of December, free of tax.

According to a law lately passed, the theft of electricity in Germany is punishable by imprisonment or by the imposition of a fine and possibly the loss of civil rights.

Exhibitions of gas cooking-stoves have just been held at Bristol and Beverley—at the former place by Messrs. John Wright and Co., Limited, and at the latter by Wilsons and Mathesons, Limited—with lectures by Miss Silvester and Miss Atkinson.

The Leeds Fire-Clay Company (Engineering Department) have just secured an order for a fourth installation of shallow regenerators at the Normanton Gas-Works. They have also been entrusted with the erection of a new retort-house, fitted complete with shallow regenerators, at the Easingwold Gas-Works, and with an order for shallow regenerators at the Padiham Gas-Works.

The Lytham District Council have decided, on the recommendation of the Gas Committee, to abolish meter-rents.

Messrs. James Milne and Son, Limited, have recently secured the contract from the Glasgow Corporation for a new station meter, of 150,000 cubic feet per hour capacity, for their Tradeston works; and have obtained an order from the Dundee Corporation for one of the same capacity. In addition to these orders, the firm have in hand for the Gas Commissioners of Wishaw a square station meter of 25,000 cubic feet capacity.

We have received from the publishers (Messrs. E. & F. N. Spon, Limited) "Spons' Architects and Builders' Price Book for 1900," by W. Young. This is the 27th edition of the book, and, as far as bulk is concerned, it is similar to its immediate predecessor. The editions for recent years, however, have contained a chapter on electricity, with complete specifications and estimates of electric lighting installations carried out by the author.

Messrs. Mather and Platt, Limited, of Manchester, have taken over the business of the Reeves Patent Filters Company, Limited, of London, and are issuing a tastefully got-up pamphlet in which a description of their filters is given, together with a number of illustrations taken from photographs of plant installed by the Reeves Company and themselves. The firm are the sole licensees for the Archbutt-Deeley system of softening hard water for town supplies, works, &c., and for the purification of trade effluents.

The operative clause in the Order in Council with respect to the use of acetylene now stands as follows: "Her Majesty is pleased, by and with the advice of Her Privy Council, to order and prescribe that acetylene in admixture with air or oxygen, declared to be an explosive by this Order, shall be prohibited from being manufactured, imported, kept, conveyed, or sold: Provided that nothing in this Order shall apply to acetylene in admixture with air when such admixture takes place only in a burner or contrivance in which the mixture is intended to be burnt; provided also that nothing in this Order shall be held to apply to an admixture of acetylene and air which may unavoidably occur in the first use or recharging of an apparatus properly designed and constructed with a view to the production of pure acetylene."

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**BANK HOLIDAY.**

**NOTICE TO ADVERTISERS.—In consequence of the BANK HOLIDAY (April 16), orders with respect to ADVERTISEMENTS should be received at the Office *not later* than THE FIRST POST ON SATURDAY NEXT.**

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TO GAS COMPANIES AND CORPORATIONS.

IMPROVED CARBONIZING RESULTS.
**A PRACTICAL Gas Engineer of 25** Years' Experience in both London and Provincial Gas-Works is open to VISIT GAS-WORKS, and ADVISE and REPORT upon the Best Methods in Working, by which the very best Results may be obtained. Gas-Works Managed *pro tem.* Terms moderate.
Address No. 3459, care of Mr. King, 11, Bolt Court, FLEET STREET E.C.

**WANTED, a Gas-Works Fitter, com-** petent to lay Mains and Services, fix Slot Installations and Stoves. Wages 30s. per week.
Apply, with References, to the MANAGER, Gas-Works, DORKING.

DRAUGHTSMAN.

**WANTED, by the Cheltenham Gas** Company, an experienced DRAUGHTSMAN.
Apply, stating Age, and Salary expected, to Mr. R. O. PATERSON, Engineer and Manager.

**WANTED, a Young Man for fixing** Meters, Stoves, &c., and make himself generally useful.
Apply, stating Age and Wages required, to A. BIRD, Manager, Gas-Works, BROMSGROVE.

**DRAUGHTSMAN Wanted for Con-** structional and General Engineering. One used to Elevating and Conveying Machinery for Gas-Works preferred. State Age, Experience, and Salary required.
WEST'S GAS IMPROVEMENT COMPANY, LIMITED, Miles Platting, MANCHESTER.

TO GAS-WORKS PLANT ERECTORS.

**WANTED, a Man to take charge of the** erection of part of a Gas-Works Plant, including Dismantling.
Apply, by letter, to No. 3472, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FINEDON GAS COMPANY, LIMITED.

**WANTED, by the Directors, a thoroughly** qualified MANAGER for their Gas-Works. (Make about 10 millions per annum.)
Applicants to state Age, Experience, and Salary required (House, Gas, Coal, and Garden provided), and to send in written applications, on or before April 9, to J. T. HAWTHORN, Esq., Chairman, Finedon, NORTHS.

**WANTED, by a Firm of Gas Engineers'** a DRAUGHTSMAN accustomed to Elevating and Conveying Machinery.
Apply, by letter, to No. 3465, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, Gas-Meter Repairers. Must** be good Tinmen. Good Wages and constant work for steady Men. None other need apply. An industrious all-round Man would eventually be made Foreman at an advanced Salary and other privileges.
Apply, by letter, to No. 3470, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF BRADFORD.
(GAS DEPARTMENT.)

**WANTED, an Experienced Draughts-** MAN.
Apply, by letter, stating Age and Salary expected, to
CHAS. WOOD,
Engineer and Manager.

GAS-STOVE TRADE.

**WANTED, a capable Works Manager** in a large established Business in the Midlands.
Applicants must state fully (by letter) previous Experience, Age, Salary, when Disengaged, &c., to No. 3469, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, a steady reliable Man as** STOKER, used to Shovel Charging, Engine and Exhauster. Wages, 31s. 6d. per week, with Week's Holiday in Summer. Also a good Man to lay Mains, Services, and do General Repairs. Permanent Situation to a suitable Man.
Apply to the MANAGER, Gas-Works, Rickmansworth, HERTS.

CANTERBURY GAS AND WATER COMPANY.

**WANTED, a competent Fitter at the** Water-Works Station. One with a knowledge of Pumping Machinery, and capable of acting as Second Engineer preferred.
Apply, stating Age and Wages required, to
JAMES BURCH,
General Manager and Secretary.
Canterbury, April 3, 1900.

**WANTED, by a Suburban Gas Com-** pany, a FOREMAN of the Distribution Department. Must be of good address, have a thorough knowledge of Main and Service Laying, and of the Fixing of Gas Cookers, Fires, and Engines, and be capable of carrying out the various duties attached to the position. House, Coal, and Gas free.
Applicants must apply by letter, in own handwriting, stating Experience and Wages required, and enclosing *copies* of not more than three Testimonials of recent date, to No. 3471, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF TIVERTON.

**WANTED, in the Borough Accountant's** Office, a CLERK and COLLECTOR of the Gas Accounts. Salary £1 per week; Guarantee required £100.
Applications, stating Age and previous Experience, and enclosing not more than three recent Testimonials (*copies only*), to be sent in on or before the 14th inst. to
J. SIDDALLS,
Borough Surveyor and Accountant.
Town Hall, Tiverton,
April 2, 1900.

**SHARES wanted in C. & W. Walker,** Limited, either Preference or Ordinary.
State Number for disposal and Price required to No. 3468, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**CONDENSER (Morris & Cutler's), 21 ft.** 6 in. by 6 ft. 6 in. by 3 ft. 6 in., 1 million per day. Equal to new. Exceptional Bargain, if sold promptly.
Address No. 3463, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**FOR SALE—A small Station Meter,** Capacity about 4000 cubic feet per hour, with 6-inch Connections and Four-Way Valve. In good condition. Can be seen on appointment.
R. WATSON, Gas-Works, HERTFORD.

**FOR SALE—Two Lancashire Boilers,** each 6 ft. diameter by 20 ft. long, with Mountings. Been in use only a short time. Made by the Yorkshire Engine Company, Limited, Sheffield.
Apply to NEWTON, CHAMBERS, & CO., LIMITED, Thorncliffe Iron-Works, near SHEFFIELD, where the Boilers may be seen.

**TWO complete Circles of Side Plates** FOR SALE, forming CAST-IRON TANK, 26 feet diameter by 6 feet deep, Metal ¾-inch thick, Caulked Joints. Sketch on application.
Offers per ton on Truck in Surrey invited by JAS. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C., until April 16.

**EXHAUSTERS, 1500 to 60,000 feet per** hour, with or without Engines.
LIVESEY WASHERS, CUTLER CONDENSER, SCRUBBERS, 5 feet and 6 feet diameter, METERS, GOVERNORS, PURIFIERS (Sets of 6 feet and 10 feet square), BOILER and other TANKS, VALVES, &c.,
J. FIRTH BLAKELEY & Co., Thornhill, DEWSBURY.

**GAS PLANT for Sale—I can always offer** NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

BARNOLDSWICK URBAN DISTRICT COUNCIL
(GAS DEPARTMENT.)

**FOR SALE—Seventy Furnace Grate Bars,** 2 inches square, 4 ft. 3½ in. long. All new.
Apply to
D. E. GARLICK,
Manager.

**FOR SALE—Gas-Works Plant complete,** except Stone and Brick Buildings. The entire Works must be moved at once; and under these circumstances will be sold at the low Price of £850, including Purifiers, Station Meter, Gasholder, Governor, &c., capable of manufacturing 1 million cubic feet per month.
Apply to CHARLES D. PHILLIPS, Emlyn Works, Newport, MON.

CITY OF HULL WATER AND GAS DEPARTMENT.

GAS PLANT FOR SALE.

**RETORT-HOUSE FITTINGS**—Retort-FITTINGS for 120 Round Retorts, 16 inches diameter, Wrought-Iron Lids, Screws, and Cross-Bars, 7 inch to 5 inch and 6 inch to 4 inch Ascension, Arch, and Dip Pipes.
One HYDRAULIC MAIN ⊃ shape, 31 ft. by 18 in. by 18 in.
One HYDRAULIC MAIN ⊃ shape, 41 ft. by 18 in. by 18 in.
Thirteen HYDRAULIC MAINS ⊃ shape, 6 ft. 9 in. by 16 in. by 16 in.
Thirteen 6-inch SEAL-VALVES.
9-inch and 10-inch CAST-IRON FOUL-MAINS.
40 yards of 15-inch STEEL FOUL-MAIN.

**CONDENSERS**—
Set of six Cast-Iron ANNULAR CONDENSERS Outer Tube 2 feet, Inner Tube 10 inches, with Inlet and Outlet Valves and Bye Pass.

**TAR-EXTRACTOR**—
Patent CARBONIC ACID and TAR EXTRACTING WASHER, by C. & W. Walker, for 500,000 cubic feet per day, 12-inch Valves and Bye-Pass.

**WASHER**—
One WASHER by Kirkham, Hulett, and Chandler for 500,000 cubic feet per day, with Steam-Engine, 10-inch Valves, and Bye-Pass complete.

**PURIFIERS**—
One set of Four PURIFIERS, 15 feet square, 4 feet deep, with Centre-Valve, and 15-inch Connections, Columns and Girders for fixing on first floor, together with Lifting Tackle.
One set of Two PURIFIERS, 15 feet square, 4 feet deep, with Centre-Valve, and 15-inch Connections. Columns and Girders for fixing on first floor, together with Lifting Tackle.

**EXHAUSTERS AND STEAM-ENGINES**—
Two 30,000 cubic feet per hour EXHAUSTERS and ENGINES, nearly new, by George Waller and Co.
12-inch Automatic BYE-PASS.
8-inch THROTTLE VALVE.
8-inch improved COMPENSATING GOVERNOR.
Two patent STEAM COMPENSATING GOVERNORS.
12-inch CONNECTIONS complete.

**BOILERS**—
Two Steel CORNISH BOILERS, 16 ft. by 5 ft. 6 in., with Galloway Tubes, Mountings complete for 70 lbs. pressure.

**GASHOLDERS**—
One THREE-LIFT GASHOLDER, about 71 feet diameter by 20 feet deep. Wrought-Iron Standards, Girders, Valves, and Connections.
One TWO-LIFT GASHOLDER, about 49 feet diameter by 18 feet deep. Cast-Iron Columns, Girders, Valves, and Connections.
Two TWO-LIFT GASHOLDERS, 46 feet diameter by 18 feet deep. Cast-Iron Columns, Girders, Valves, and Connections.

**STATION METER**—
STATION METER, to pass 30,000 cubic feet per hour.

**GOVERNORS**—
14-inch and 6-inch GOVERNORS.

**PUMPS**—
Various STEAM, TAR, LIQUOR, and WATER PUMPS.

**GAS-ENGINE**—
12-Horse Power by Crossley Bros.

**VALVES**—
DONKIN and other VALVES.

The above-mentioned Machinery, &c., may be seen on application to the undersigned.
Offers for the whole, or any part, of the Plant to be addressed to the Chairman of the Water and Gas Committee, and delivered to the Office of the Town Clerk, Hull.

By order,
F. J. BANCROFT,
Water and Gas Engineer.

NEW MILLS URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TO GASHOLDER MAKERS AND OTHERS.

**THE Gas Committee are prepared to** receive TENDERS for—
1. Telescoping GASHOLDER, with Outer Lift, 63 ft. diameter by 20 ft. deep, with Guide-Framing.
2. RETORT SETTING and FIRE-CLAY GOODS.
Plans and Specification can be seen, and all Information obtained, from Mr. Edward Jones, Gas Engineer.
Tenders, endorsed "Gasholder," or "Retorts," as the case may be, to be sent to me, the undersigned, not later than April 21, 1900.
The Committee do not bind themselves to accept the lowest or any Tender.

JOSEPH POLLITT,
Clerk to the Council.
Town Hall, New Mills,
March 26, 1900.

## DERBY GASLIGHT AND COKE COMPANY.

TENDERS FOR TAR.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the surplus TAR they will have for disposal during the Twelve Months ending March 31, 1901—namely, about 2500 Tons.

Full Particulars can be obtained on application to the undersigned.

By order,
RICHARD FISHER,
Secretary.

April 4, 1900.

## BOROUGH OF LEIGH.

(GAS DEPARTMENT.)

THE Gas Committee of the above Corporation invite TENDERS for the supply of SULPHURIC ACID during the Twelve Months ending June 30, 1901.

Forms of Tender and further Particulars may be obtained from the Manager, Mr. John Foster, Gas-Works, Leigh.

Sealed Tenders, endorsed "Tender for Sulphuric Acid," to be delivered to me on or before Twelve o'clock noon, on Saturday, April 21, 1900.

By order,
PEREGRINE THOMAS,
Town Clerk.

Town Hall, Leigh, Lancs.,
April 3, 1900.

## BOROUGH OF LEIGH.

(GAS DEPARTMENT.)

THE Gas Committee of the above Corporation invite TENDERS for the supply of 12,000 Tons of GAS COAL and 2000 Tons of CANNEL, during the Twelve Months ending June 30, 1901.

Forms of Tender and further Particulars may be obtained from the Manager, Mr. John Foster, Gas-Works, Leigh.

Sealed Tenders, endorsed "Tender for Coal or Cannel," as the case may be, to be delivered to the undersigned not later than Twelve o'clock noon, on Saturday, April 21, 1900.

By order,
PEREGRINE THOMAS,
Town Clerk.

Town Hall, Leigh, Lancs.,
April 3, 1900.

## MARKET HARBOROUGH URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Gas Committee of the above are prepared to receive TENDERS for the supply of the whole or part of from 3500 to 4000 Tons of Best Screened GAS COALS or NUTS, to be delivered as may be required during the Year ending May 31, 1901, at the Sidings of the London and North-Western Railway or Midland Railway Station, Market Harborough.

Forms of Tender, and any further Information, may be had on application to the undersigned, to whom sealed Tenders, endorsed "Tender for Coal," must be delivered on or before the 24th inst.

The lowest or any Tender not necessarily accepted.

A. T. HARRIS,
Engineer and Manager.

Gas Offices: St. Mary's Road,
Market Harborough, April 3, 1900.

## LIVERPOOL UNITED GASLIGHT COMPANY.

TENDERS FOR CANNEL AND COAL.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 140,000 Tons of CANNEL, and 140,000 Tons of COAL, to be delivered at the various Works of the Company during the period of Twelve Months, between the 1st of July, 1900, and the 30th of June, 1901.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Full Particulars and printed Forms of Tender can be obtained on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom Tenders (on the printed Form only) must be delivered, at or before Ten a.m., on Wednesday, April 18, endorsed 'Tender for Cannel and Coal."

By order,
WILLIAM KING,
Engineer.

Gas Office, Duke Street,
Liverpool, March 28, 1900.

## SOUTHEND GAS COMPANY.

TENDERS FOR COALS.

THE Directors of the above Company invite TENDERS for the supply of 10,000 (Ten Thousand) Tons of either Best Unscreened SILKSTONE or DURHAM GAS COALS.

To be delivered at the Railway Station, Great Eastern Railway, or London, Tilbury, and Southend Railway, Southend, or alongside opposite the Company's Works, during the period of Twelve Months between June 1, 1900, and May 31, 1901, in quantities from time to time as the Engineer shall direct.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Any further Particulars can be obtained by making application to the Engineer (Mr. Frank Clark).

Sealed Tenders, to be addressed to the Chairman, endorsed "Tender for Coal," at the Offices of the Company, not later than the 14th day of April next.

By order,
JAS. T. RANDALL,
Secretary.

Offices: No. 52, High Street,
Southend-on-Sea, March 31, 1900.

## LICHFIELD GAS COMPANY.

TENDERS FOR COAL AND LIME.

THE Directors of the above Company invite TENDERS for the supply of 5000 Tons of GAS COAL, and 100 Tons of LIME for Purification, to be delivered as required during the Twelve Months commencing July 1, 1900.

Forms of Tender supplied on application to the undersigned.

Tenders to be endorsed, and addressed to the Chairman not later than April 28.

FREDERICK KEY,
Engineer and Manager.

Gas Offices, Lichfield,
April 3, 1900.

## ALDERSHOT GAS AND WATER COMPANY.

THE Directors of this Company are prepared to receive TENDERS for the supply of 20,000 Tons of GAS COAL and 500 Tons of CANNEL, for delivery from July 1, 1900, to June 30, 1901.

Copies of Specification and Conditions can be had on application to the undersigned.

Sealed Tenders, endorsed "Tenders for Coal," should be sent to me not later than Five p.m., May 9, 1900.

The Directors reserve the right not to accept the lowest or any Tender.

By order,
R. W. EDWARDS,
Secretary.

General Offices, Aldershot,
March, 1900.

## COUNTY BOROUGH OF BURY.

TO SULPHURIC ACID MAKERS.

THE Gas Committee are prepared to receive TENDERS for the supply of about 400 Tons of SULPHURIC ACID for the Manufacture of Sulphate of Ammonia for a period of One Year from the 1st of May, 1900.

Form of Tender and Conditions may be obtained on application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Bury.

Sealed Tenders, endorsed "Tender for Acid," to be sent to the undersigned on or before Monday, the 16th inst.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bank Street,
Bury, April 6, 1900.

## ILFORD GAS COMPANY.

THE Directors of the Ilford Gas Company are prepared to receive TENDERS for the supply and erection of a THREE-LIFT GASHOLDER, 156 feet diameter by 35 feet deep, on Land adjoining the Company's Works, Ilford, Essex.

Drawings, Specifications, and Forms of Tender may be had on payment of Two Guineas (not returnable), on application to the undersigned, from whom any further Information may be obtained.

Tenders, endorsed "Gasholder," to be sent in to the above Works, addressed to John Denney, Esq., Secretary, Ilford Gas Company, Gas-Works, Ilford, on or before Monday, the 23rd inst.

J. H. BROWN,
Engineer.

Gas-Works, Ilford, E.,
April 4, 1900.

## FARNHAM GAS COMPANY, LIMITED.

TENDERS FOR COALS.

THE Directors of the Farnham Gas Company, Limited, are prepared to receive TENDERS from Persons willing to supply and deliver, free of all Dues and Charges, at the Farnham Station, London and South-Western Railway, 3000 Tons of the following descriptions of GAS COAL—viz., New Pelton, Pelaw Main, or Strafford Silkstone—to be delivered in quantities of 50 Tons (at intervals) before the 31st of March, 1901. The Coals to be consigned to the order of the Farnham Gas Company, Limited, at the Farnham Railway Station.

In the case of Seaborne Coal, the Meter's Certificate of each quantity to be duly sent with invoice of same.

Payment monthly.

Sealed Tenders, marked "Tender for Coal," to be delivered to the Secretary, Mr. W. Wells, 112, West Street, Farnham, Surrey, not later than Eleven o'clock a.m., on Saturday, the 5th of May, 1900, of whom Forms of Tender may be obtained.

The Directors reserve the right to reject the lowest or any Tender.

April 7, 1900.

## BOROUGH OF PLYMOUTH.

THE Plymouth Corporation are prepared to receive TENDERS for the under-mentioned Articles, in connection with the Street Lighting of the Borough, viz:—

CONTRACT No. 1.—LANTERNS, FROGS, &c.
CONTRACT No. 2.—INCANDESCENT BURNERS, MANTLES, GOVERNORS, STOPCOCKS, &c.

Contractors may not Tender for a part of any Contract.

Copies of the Conditions, Specifications, and Forms of Tender, bound up together, may be had from the undersigned on the deposit of One Guinea for each copy, which will be returned upon the receipt of a *bonâ-fide* Tender upon the prescribed form, and within the stated time.

It is a condition of tendering that samples of the various Articles required shall accompany the Tender.

Should a Contractor withdraw his Tender, the amount of his deposit will be forfeited.

Sealed Tenders, endorsed, "Contract No. ....," must be delivered to the undersigned not later than the 3rd day of May, 1900.

The Corporation do not bind themselves to accept the lowest or any Tender.

JOHN H. RIDER,
Borough Electrical Engineer.

Prince Rock, Plymouth,
April 6, 1900.

## BOROUGH OF BRIGHOUSE.

RETORT CARBON.

THE Gas Committee are prepared to receive TENDERS for the purchase of the RETORT CARBON which they have at their disposal

Tenders, endorsed "Carbon," to be sent in on or before April 20, addressed to the undersigned.

No Tender necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Municipal Offices,
Bighouse, April 3, 1900.

## BOROUGH OF NELSON.

THE Gas Committee of the above Corporation invite TENDERS for the surplus TAR and LIQUOR produced at their Works, for a period of Twelve Months, commencing on May 1, 1900.

Forms of Tender and further Particulars may be obtained from Mr. A. Allan, Gas Engineer, Nelson.

Sealed Tenders, endorsed "Tar, &c.," to be sent to me, the undersigned, on or before the 19th day of April, 1900.

R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson,
April 4, 1900.

THE Corporation of Middleton are prepared to receive TENDERS for the supply of 600 9-inch and 700 4-inch CAST-IRON GAS-MAINS.

Specification may be had from Mr. T. Duxbury, Gas Engineer.

Tenders, endorsed "Tender for Mains," and addressed to the Chairman of the Gas, &c., Committee, to be delivered at my Office on or before the 25th of April.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
April 5, 1900.

## TENDERS FOR GAS COAL.

THE Directors of the Newmarket Gas Company invite TENDERS for the supply of from 1000 to 6000 Tons of best screened GAS COAL, to be delivered as required during the ensuing Twelve Months ending May 31, 1901.

Tenders, stating Price per ton delivered free at Newmarket Station, to be sent to the undersigned on or before Monday, the 16th inst., from whom any further Particulars may be obtained.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
April 4, 1900.

## CLACTON URBAN DISTRICT COUNCIL.

THE Gas and Water Committee of the above Council are prepared to receive TENDERS for the manufacture and delivery of about 50 Tons of CAST-IRON PIPES and CONNECTIONS.

Copy of the Specification and Form of Tender may be obtained from the Engineer, Mr. Sydney Francis, Town Hall, Clacton-on-Sea.

Sealed Tenders, endorsed "Tender for Pipes," to be delivered to the undersigned not later than Twelve o'clock noon on Monday, April 23, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

Town Hall Buildings,
Clacton-on-Sea.

GEO. T. LEWIS,
Clerk.

## COCKERMOUTH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR A NEW OR SECOND-HAND GAS-ENGINE AND EXHAUSTER.

THE Gas Committee of the above Council are prepared to receive TENDERS for the supply of a 1-horse power GAS-ENGINE. Also a ROTARY EXHAUSTER capable of passing 10,000 cubic feet per hour.

Combined or separate Tenders invited.

Prices to be for the Machinery delivered at Cockermouth.

The Committee do not bind themselves to accept the lowest or any other Tender.

Tenders to be sent to me not later than April 12, 1900.

HAROLD BAKER,
Engineer and Manager.

Gas-Works, Cockermouth,
March 29, 1900.

## GLOUCESTER GASLIGHT COMPANY.

GASHOLDER TANK,

THE Directors of the above Company invite TENDERS for the construction of a BRICK GASHOLDER TANK (about 156 feet in diameter and about 41 feet deep) at their Works, Hempsted.

Plans may be seen, and Specifications obtained, on application to the Company's Engineer, Mr. W. S. Morland, Gas-Works, Hempsted, near Gloucester, and on payment of £1 1s, which will be returned on the receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Tender for Gasholder Tank," to be sent to the undersigned at the Gas Offices, Eastgate Street, Gloucester, not later than Tuesday, the 1st day of May, 1900.

The Directors do not bind themselves to accept the lowest or any Tender.

WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
April 5, 1900.

**IMPERIAL CONTINENTAL GAS ASSOCIATION.**
(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 1st of May next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 31st of December, 1899, and the usual Ordinary Business of such Meeting transacted.

Notice is Hereby also Given, that the CAPITAL STOCK TRANSFER BOOKS WILL BE CLOSED from the 17th inst. to the 1st prox., both days inclusive.

The Dividend will be paid on the 8th of May.

By order of the Board,
ROBERT W. WILSON,
Secretary.

21, Austin Friars, London, E.C.,
April 9, 1900.

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ISSUE OF SIX PER CENT. PREFERENCE SHARES.

**BOURNEMOUTH GAS AND WATER COMPANY.**

Sale by Tender of 1000 Six per cent. Preference Shares in pursuance of the provisions of the Bournemouth Gas and Water Act, 1896.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company TO SELL BY TENDER 1000 PREFERENCE SHARES of £10 each (the Dividend on which is limited to £6 per cent.), to be paid up in full on or before the 31st of May, 1900.

Particulars and Conditions of Tender may be obtained at the Company's Offices, Bournemouth, or of the Secretary as under.

Sealed Tenders must be sent to the Secretary not later than Eleven o'clock on Friday Morning, the 27th of April, 1900.

By order,
WILLIAM CASH,
Secretary.

London: 90, Cannon Street, E.C.

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**SOUTHAMPTON GASLIGHT AND COKE COMPANY.**

ISSUE OF £10,000 FIVE PER CENT. ORDINARY STOCK.

SALE BY TENDER—MINIMUM PRICE £117 PER CENT.

INVESTMENT AT THIS PRICE WOULD YIELD FOUR-AND-A-QUARTER PER CENT.

REGISTERED FREE OF ALL EXPENSES.

THE Directors invite Tenders for £10,000 of ORDINARY STOCK, authorized to be raised under the Southampton Gas Act, 1898, entitled to a Maximum Dividend at the rate of Five Pounds per cent. per annum, payable half yearly (subject to Income-Tax.)

Allotments to the highest bidders.

Tenders must be delivered on or before Tuesday, the 17th of April, 1900.

Forms of Tender, with Particulars and Conditions, may be obtained on application to the Secretary, at the Company's Offices, Ogle Road, Southampton; or from the Company's Bankers, Grant and Maddison's Union Banking Company, Limited, Southampton and Portsmouth; or from Lloyd's Bank, Limited, Lombard Street, London.

This Company's Stocks are now quoted in the Official Lists of the London Stock Exchange.

By order of the Directors,
C. CROWTHER SMITH,
Secretary.

Southampton, March 30, 1900.

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# LONDONDERRY GAS COALS

FROM THE

## LONDONDERRY COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.

Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by

Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

**S. J. DITCHFIELD,**
**SEAHAM HARBOUR,**
COUNTY OF DURHAM.


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**SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.**

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

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By order of the Directors of the
**LEA BRIDGE DISTRICT GAS COMPANY.**

NEW ISSUE OF
£10,000 CONSOLIDATED ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 24th of April, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

---

By order of the Directors of the
**WEST HAM GAS COMPANY.**

NEW ISSUE OF 2500 £10 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, May 2, at Two o'clock, in Lots.

Particulars of the SECRETARY of the Company, at the Offices, Union Street, STRATFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

---

By order of the Directors of the
**ILFORD GAS COMPANY.**

£10,000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 8, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

---

By order of the Directors of the
**SOUTHEND WATER-WORKS COMPANY.**

NEW ISSUE OF 1000 £10 NEW ORDINARY SHARES, & 15 £10 ADDITIONAL ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 8, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

---


# HOLMSIDE GAS COALS.

**Present Daily Produce over 5000 Tons.**

*Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation*

| | |
|---|---|
| Yield of Gas per Ton . . . | 11,205 Cubic Feet. |
| Illuminating Power | 16 7/10 Stand. Sperm. Candl. |
| Coke (of good & pure quality) | 13¾ Cwt. per Ton. |
| Sulphur . . . . . | A little over 1 per Cent. |
| Ash . . . . . | Under 1 per Cent. |
| Tar . . . . . | 163 lbs. (Avoir.) per Ton. |
| Ammoniacal Liquor | 103 lbs. (Avoir.) per Ton. |

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

## SOUTH MOOR PELTON GAS COALS.

**Present Daily Produce available 3000 Tons.**

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

**MR. MARK ARCHER,**
**HOLMSIDE & SOUTH MOOR OFFICES,**
**NEWCASTLE-UPON-TYNE.**


---


**GAS PLANT** New or 2nd Hand Equipments for Coal Gas, Water Gas, Oil, Acetylene, Coke Oven, and Blast Furnace Gas.

**POWER or LIGHT WORKS.**

Also **VALUATION** Consultation, Inspection, & Expert Reports.

JAS. WRIGHT, M.I.M.E. BRIDGE HOUSE, BLACKFRIARS, E.C.

---

**THOMAS DUXBURY & CO.,**
**16, DEANSGATE, MANCHESTER.**

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

---

# BOLDON GAS COALS.

**ANALYSIS.**

| | |
|---|---|
| Yield of Gas per Ton. . | 10,500 Cubic Feet. |
| Illuminating Power . . | 16·9 Candles. |
| Coke . . . . . | 66·7 Coke. |
| Sulphur . . . . . | 0·86 Sulphur. |
| Ash . . . . . | 2·04 Ash. |

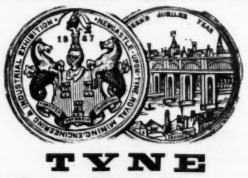
For Prices, &c., apply to
**W. H. PARKINSON,**
**THE HARTON COAL CO., LTD.,**
**NEWCASTLE-ON-TYNE.**

Telegraphic Address: "PARKINSON, NEWCASTLE."

---

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

# CANNEL & COAL.



**TYNE BOGHEAD CANNEL.**

| | |
|---|---|
| Yield of Gas per ton . . . . | 13,155 cub. ft. |
| Illuminating Power . . . . | 38·22 candles. |
| Coke per ton . . . . . | 1,301·88 lbs. |

## EAST PONTOP GAS COAL.

| | |
|---|---|
| Yield of Gas per ton . . . . | 10,500 cub. ft. |
| Illuminating Power . . . . | 17·8 candles. |
| Coke . . . . . | 70 per cent. |

## SOUTH PELAW MAIN GAS COAL.

| | |
|---|---|
| Yield of Gas per ton . . . . | 10,500 cub. ft. |
| Illuminating Power . . . . | 16·3 candles. |
| Coke . . . . . | 73·1 per cent. |

*For Prices and complete Analysis, apply to*

**THOS. W. DANCE, SON, & HUNTER,**
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
**E. FOSTER & CO.,**
21, JOHN STREET, ADELPHI, LONDON, W.C.


---


# THE WIGAN COAL & IRON CO., LIMTD.,

**Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.**

**Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.**
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

**London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.**
Telegraphic Address: "PARKER, LONDON."

# THE INTENSIFIED GAS-LIGHT CO.

*LIMITED,*

**Hereby give Notice, that they have the right, under a License, to use Welsbach Mantles in conjunction with the Intensified Burners—high and low pressures—and Purchasers of these Burners can obtain Mantles for use therewith from the Local Agents of the Welsbach Company.**

3, WILSON STREET,
DRURY LANE, LONDON, W.C.

---

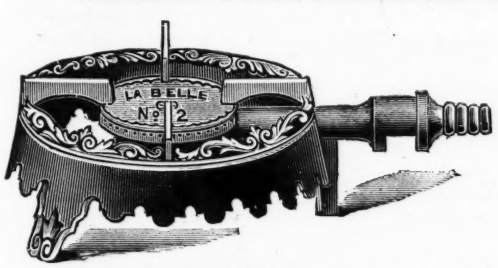
## A GOOD STOVE AT A LOW PRICE:

# "LA BELLE" GAS-STOVES

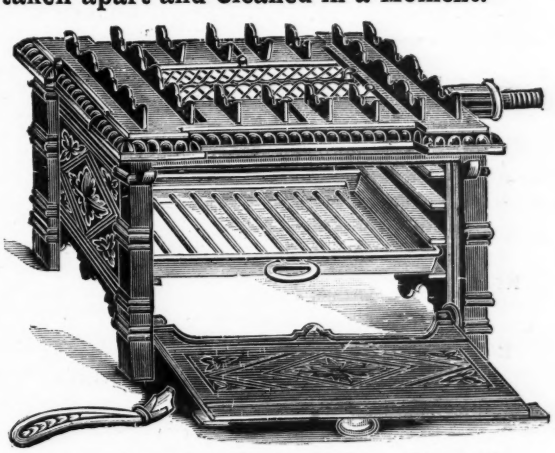
**Are MORE ECONOMICAL and CHEAPER than any OTHER STOVES of an EQUAL CAPACITY.**

**The Burner is made in two pieces, and can be taken apart and Cleaned in a Moment.**

**MAXIMUM HEAT with a SMALL CONSUMPTION OF GAS.**




**Stocked in Plain Black Iron or Coloured Enamels.**



**Stocked in Plain Black Iron, or with White Enamelled Interior.**

PRICES AND PARTICULARS FROM:—

## FALK, STADELMANN, & Co., Ld.,

VERITAS LAMP WORKS,

83 to 87, FARRINGDON ROAD, E.C.

WORKMANSHIP and MATERIALS OF THE HIGHEST QUALITY.

# PECKETT'S LOCOMOTIVES

Built to any Specification or Gauge.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

# JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

# ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

INCLINED

RETORTS

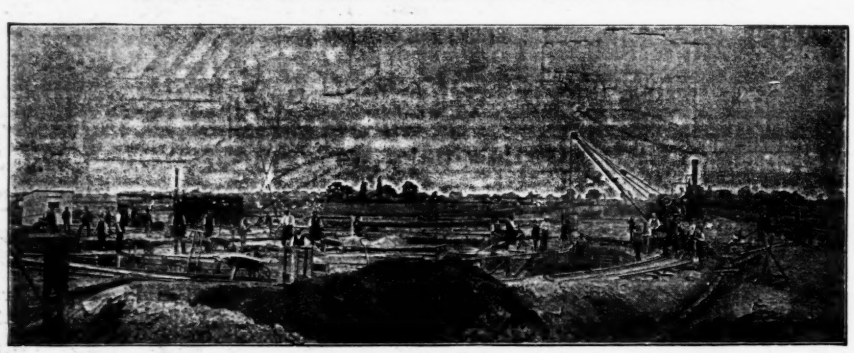
# GASHOLDER TANK, EMBANKMENT, & RAILWAY

Telegrams: "Robustness, London."

UNDER CONSTRUCTION BY OUR OWN WORKMEN.

Telephone No. 756 Bank.

RESERVOIRS, TRIAL BOREHOLES and WELLS. MAIN and SERVICE LAYING.



COMPLETE GAS and WATER WORKS ERECTED and SET to WORK including ALL MAINS.

# J. & H. ROBUS, Engineering Contractors,

20, BUCKLERSBURY, LONDON, E.C.

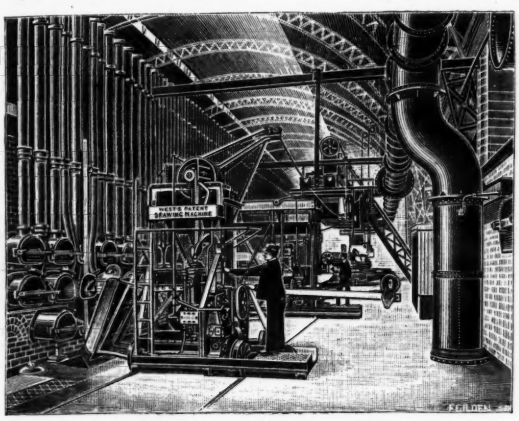
For Carbonizing Advt., see last Issue.

# WEST'S GAS IMPROVEMENT CO., LTD.,

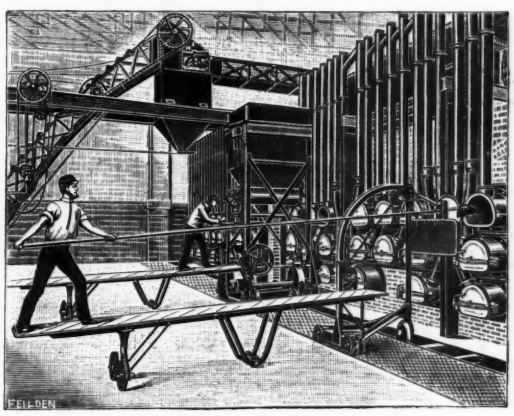
## ALBION IRON-WORKS, MILES PLATTING,

And 104, QUEEN VICTORIA STREET, LONDON, E.C.

## MANCHESTER.



West's Compressed Air Charging and Drawing Machinery for Gas-Retorts.



West's Manual Charging and Drawing Machinery for Gas-Retorts.

## WEST'S

PATENT

## Silent Coke-Conveyor.

### *SPECIAL FEATURES:*

This Conveyor is specially adapted for Elevating and Storing Coke in the Coke Yard or Overhead Hoppers.

SILENT IN ACTION, and is easily driven; the power required for driving being very small.

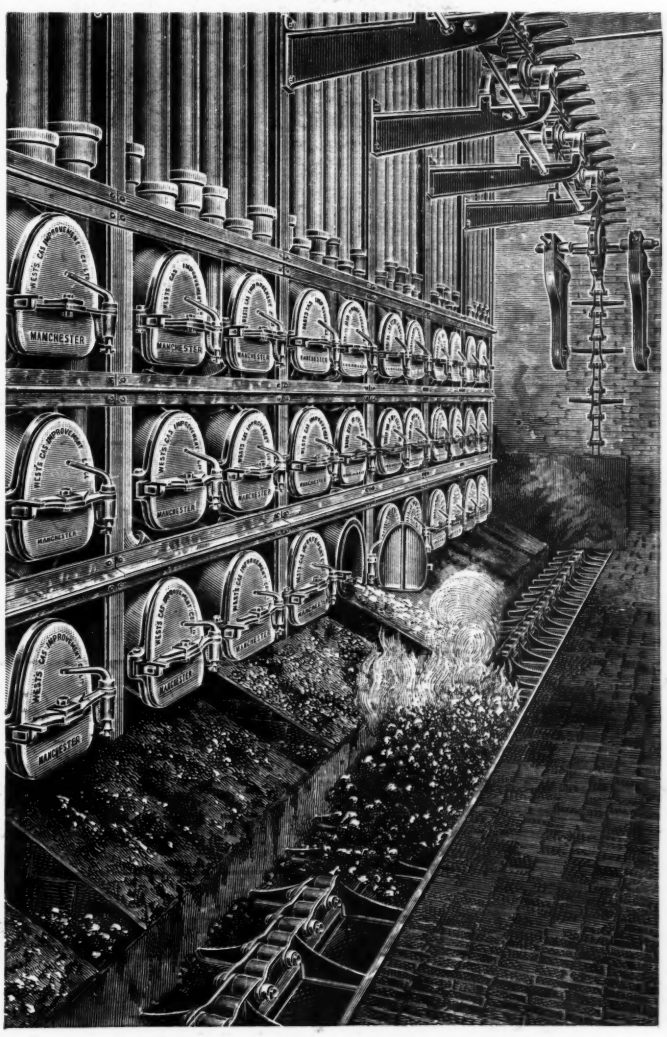
Has easily renewable and inexpensive wearing parts.

Is fitted with HUNT'S PATENT ROLLER CHAIN, which is specially adapted for the conveying of gritty materials, as the Rollers prevent excessive wear of the Chain Wheels.

The working parts of the Chain and Slide-Bar are easily and efficiently lubricated by a special lubricator fixed at one point.

No Rivets or Bolts in the Chain to work loose; the whole of the Chain being kept together by the Joint Pins.

DOES NOT MAKE ANY BREEZE, as the Coke does not roll over in its passage along the Conveyor; and no violent rubbing of the pieces against one another occurs.



*CONTRACTORS FOR*

**West's Patent Regenerator Furnaces and Settings, Mouthpieces, Retort-Bench Fittings, &c. Air-Compressors, Hauling-Capstans, and General Engineering.**

# S. CUTLER AND SONS, MILLWALL, LONDON.

## GASHOLDERS

OF EVERY SIZE AND DESCRIPTION.

CUTLER'S PATENT GUIDE-FRAMING HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

## Carburetted Water-Gas Plant.

SPECIAL DESCRIPTIVE CATALOGUE ON APPLICATION.

## PATENT WATER-TUBE CONDENSER

Over 120 now in use.

## Cutler's Patent Freezing Preventer

**For keeping Cups of Gasholders free from Ice.**

## CHARLES HUNT PATENT GAS-WASHER.

---

## THE DENAYROUZE LIGHT SYNDICATE, LTD.

28, VICTORIA STREET, WESTMINSTER, S.W.

---

***The Pioneers of Incandescent Burners without Chimneys.***

---

**THE "SMALL TORCH"** Burner (Bandsept Patent) for Street Lighting, consuming **3½** feet of Gas per Hour, having an efficiency of **25-Candle Power per Cubic Foot of Gas** consumed at ordinary pressure, is not only the **BEST** but **CHEAPEST** intensive **CHIMNEYLESS** Burner on the Market.

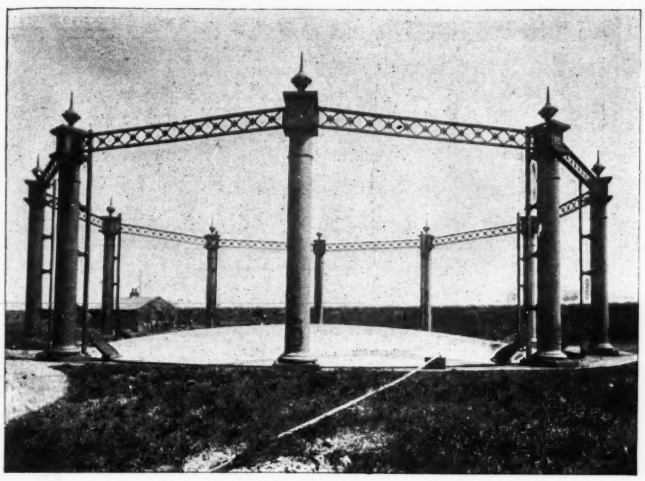
---

## PRICE COMPLETE WITH MANTLE

## 4s. 9d.

All other Burners supplied by the Syndicate proportionately reduced, full Particulars of which will shortly be issued to the Trade, and followed by new and complete Catalogue.

# GASHOLDERS



## A GASHOLDER

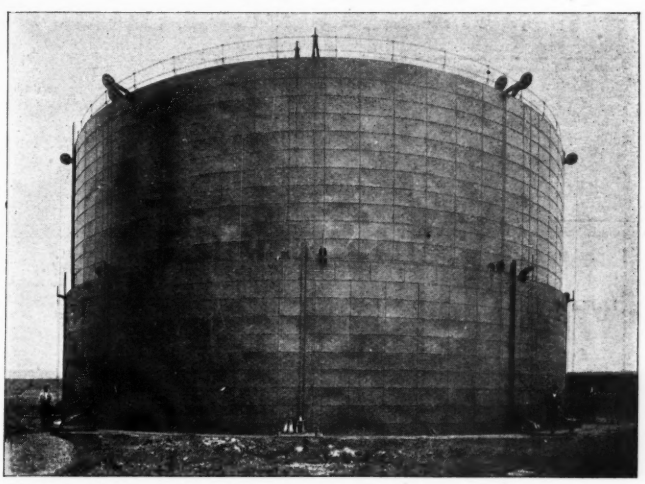
**Guided by Ten massive Cast-Iron Columns and Girders is shown in the accompanying Photo.**

## AS IT WAS

**originally erected by us**

## IN 1883.

**We last year took down the Guide-Framing, converted the Holder into a Two-Lift; and this Photo. ☛ shows it**



## AS IT IS NOW

**entirely guided by our Patent Steel Cable System.**

**In many other instances, Columns have been sold and replaced by our Cables.**

We are prepared to alter any Holders in a similar manner to the above. Engineers who have trouble with the irregular working of Column-Guided Holders, will find the Cable System vastly superior and quite reliable.

PATENTEES AND SOLE MANUFACTURERS:

## ASHMORE, BENSON, PEASE, & CO., LTD.

**GAS AND ELECTRICAL ENGINEERS,**

MANUFACTURERS OF

**Accumulators, Complete Installations for Light and Power, Gasholders (with and without Columns), Purifiers, Scrubbers, Condensers, Washers, Roofs, Girders, Sulphate Plants, Valves, &c., &c.**

*London Office:* 181, QUEEN VICTORIA STREET, E.C.

*Telegrams:* "Gasholder, Stockton-on-Tees." "Apparatus, London."

*Paris Office:* 3, SQ. DES BATIGNOLLES.

# WILSON CARTER & PEARSON,

**GAS COAL AND CANNEL FACTORS,**

**Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.**

ADDRESS CHIEF OFFICES:

**Temple Buildings, 50, New Street, Birmingham.**

# ARROL-FOULIS

**Patent Automatic Machinery**

FOR

# DRAWING AND CHARGING GAS-RETORTS.

**Full Particulars may be obtained from the Sole Makers,**

## SIR WILLIAM ARROL & CO., Limited,

**GLASGOW.**

[See Illustrated Advertisement, April 3, p. 848.]

# BEST & LLOYD

Limited,

MAKERS OF THE **BIRMINGHAM.**

## PATENT "SURPRISE" PENDANT,

**WITH PATENT SHADE.**

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

**Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.**

"IN CONJUNCTION WITH

**THE INCANDESCENT GAS-LIGHT**

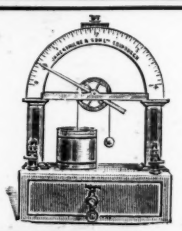
it quite **supersedes** the familiar three-light pendent. We are able to bear witness to the **convenience** of the New Pendant."

# JAMES MILNE & SON, LTD.,

GAS ENGINEERS

MILTON HOUSE WORKS EDINBURGH.

LONDON. —— LEEDS. —— GLASGOW.



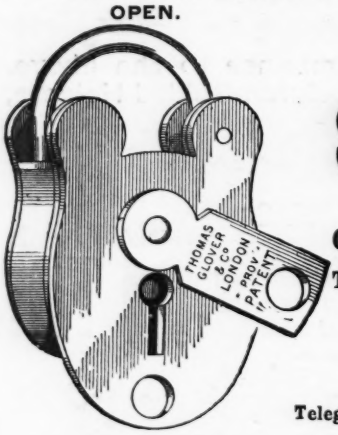
ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

**THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;**

*The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.*

OPEN.




THOMAS GLOVER & CO.'S

**PATENT**

# SECURE PADLOCK

PREVENTS TAMPERING WITH THE

**CASH-BOXES OF PREPAYMENT METERS.**

**The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.**

**Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.**

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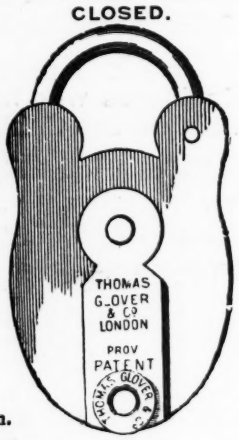



# THOMAS GLOVER & CO., LTD.,

**DRY GAS-METER MANUFACTURERS,**

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

**BRISTOL:** 28, BATH STREET. *Telegraphic Address: "GOTHIC."* **Telephone No. 1805.**

**BIRMINGHAM:** 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

**MANCHESTER:** 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."* **Telephone No. 3396.**

**GLASGOW:** 69-71, McALPINE STREET. *Telegraphic Address: "GASMAIN."* **Telephone No. 6107.**

## HARPER & MOORES,
**STOURBRIDGE.**

MANUFACTURERS OF
**BEST FIRE-BRICKS, GAS-RETORTS,**
**LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.**
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

**Manufacturers of Glasshouse Pots and Crucibles of every kind.**
**Established 1836.**

## JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N.
GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
*16, Lightbody Street.*
LEEDS:
*Queen Street.*

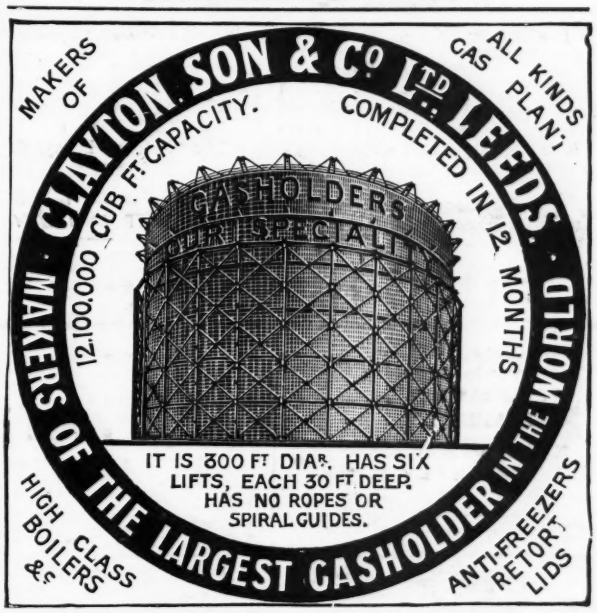
**MACHINE-MADE RETORTS**

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

**RETORTS CAREFULLY PACKED FOR EXPORT.**
**Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.**

## BOWENS' Ltd. Successors,
**STOURBRIDGE.**

MANUFACTURERS OF
**BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.**
**Established 1860.**


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
SPECIALITY
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

**GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.**

**London Office: 60, QUEEN VICTORIA STREET, E.C.**
*Telegraphic Addresses: "GAS, LEEDS." "ECLARAGE LONDON."*

# INTERESTING EXTRACT FROM AN ENGINEER'S LETTER.

**RECEIVED JAN. 25, 1900.**

"During the Summer this town was visited by a severe typhoon **LASTING THREE DAYS.** The peculiarity of our typhoon is the wind seems to come in **TREMENDOUS GUSTS** from varying directions. This, of course, tests the stability of any structure; and you will therefore be glad to hear that your **SPIRAL-GUIDED GASHOLDER** stood the trial admirably. Our Gasholders with Columns and Girders were oscillating over 4 inches; but although the spiral was inflated well up in the second lift, there was **NO VISIBLE MOVEMENT.** This is extremely gratifying to me after advising my Directors to adopt your type. Please let me know **IF YOU CAN INCREASE THE STORAGE OF MY OTHER GASHOLDERS ON THIS SYSTEM** by adding additional Lifts."

**Any further Information required should be obtained from**

# R. & J. DEMPSTER, LTD.

**(Who are Sole Proprietors of the Spiral Gasholder Patents),**

**GAS PLANT WORKS, OLDHAM ROAD,**

# MANCHESTER.

Telegraphic Address:
"Scrubber, Manchester."
Telephone Nos. 54 & 2296.

London Office:
165, Gresham House,
Old Broad Street, London, E.C.

# HUTCHINSON BROS. & CO. LD.

**GAS ENGINEERS, &c.,**

MANUFACTURERS OF

## Improved Wet & Dry Gas-Meters.

**STATION-METERS. LAMP-METERS.**

*Test Gasholders and General Gas Apparatus.*

**Brass Main & Lamp Taps. Unions, Ferrules, &c.**

**The "Falcon" Lamplighter's Torch. Service Cleansers.**

SYPHON AND OTHER PUMPS.

WOOD AND WROUGHT-IRON PURIFIER-GRIDS. SCRUBBER BOARDS.

WET AND DRY METERS REPAIRED.

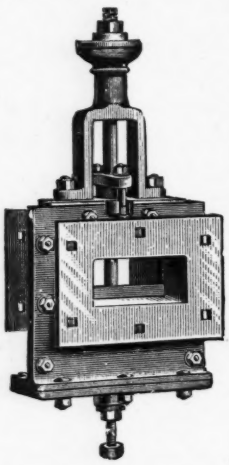
**FALCON WORKS, BARNSLEY.**

*Telegrams: "HUTCHINSON BROS., BARNSLEY."*

---

**Telegraphic Address: "CLAPHAM BROS., KEIGHLEY."**

**National Telephone No: "KEIGHLEY 35."**



*"TRADE FOLLOWS THE FLAG"*

# CLAPHAM BROTHERS LTD

**KEIGHLEY, YORKS. ESTABLISHED 1837**

**"SPECIALTIES"**

*London Representative:*
THOMAS B. YOUNGER., C.E.
CHESTERFIELD HOUSE, 98, GREAT TOWER STREET.

*Contractors to Her Majesty's Government.*

**WELLINGTON, NELSON, AND MARKET STREET WORKS.**

---

LONDON OFFICE:

**34, VICTORIA ST., WESTMINSTER, S.W.**

TELEGRAPHIC ADDRESS: "DRAKESON, HALIFAX."

TELEPHONE No. 43 "HALIFAX EXCHANGE."

GAS ENGINEERS. CONTRACTORS. IRONFOUNDERS.

# JONAS DRAKE & SON

SOLE AGENTS FOR

**HISLOP'S**

**PATENT REGENERATIVE FURNACES**

— FOR —

**ENGLAND, WALES & ABROAD.**

**RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.**

**RESULTS GUARANTEED.**

**OVENDEN HALIFAX**

RETORT SETTERS. FURNACE BUILDERS. ETC. ETC.

Designs and Estimates on Application.

# GASEOUS FIRING A SPECIALTY.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